



# AMERICA'S NATURAL GAS PIPELINE NETWORK

DELIVERING CLEAN ENERGY FOR THE FUTURE

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Summer 2009 edition



The Interstate Natural Gas Association of America



It is a pleasure to provide you with the second edition of the INGAA Interstate Pipeline Desk Book. In a single, easy-to-use volume, the Desk Book captures a wealth of background information about the interstate natural gas pipeline industry in the United States. The Desk Book spans many topics, including the evolution of natural gas regulation, current challenges facing the industry, the legal and regulatory framework under which pipelines operate, and new and evolving issues such as post-9/11 security and the potential regulation of greenhouse gas emissions. The volume also provides background on the construction and operation of natural gas transmission lines and an extensive glossary of natural gas industry terminology.

The Interstate Natural Gas Association of America is the trade organization that advocates regulatory and legislative positions of importance to the natural gas pipeline industry in North America. INGAA represents virtually all of the interstate natural gas transmission pipeline companies operating in the U.S., as well as comparable companies in Canada and Mexico. Its member companies transport over 95 percent of the natural gas that flows in interstate commerce through a network of approximately 220,000 miles of pipelines.

INGAA's advocacy on behalf of the interstate natural gas pipeline industry is supported by research sponsored by The INGAA Foundation, Inc. The Foundation works to facilitate the efficient construction and safe, reliable operation of the North American natural gas pipeline system, and promotes natural gas infrastructure development worldwide. Membership in the Foundation includes a broad span of companies and associations that share an economic nexus with the interstate pipeline industry.

The INGAA Interstate Pipeline Desk Book will be an evolving document. This second edition of the desk book provides updates on developments and highlights issues that have emerged since we published the inaugural edition in 2007. We hope that you find this to be a valuable reference source and welcome your comments in response to the Desk Book.

Best wishes on behalf of INGAA,

A handwritten signature in black ink, appearing to be "Sh 2 J" or similar, written in a cursive style.





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# INTERSTATE NATURAL GAS PIPELINE DESK REFERENCE

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# I. Pipeline Construction and Operations



The Interstate Natural Gas Association of America



I. Pipeline Construction and Operations

- a. The Pipeline Construction Process..... 1
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# I.a

## THE PIPELINE CONSTRUCTION PROCESS

Natural gas pipelines are constructed in response to the evolving supply and demand dynamics of the natural gas market. In order to construct an interstate pipeline, a company must receive authorization from the Federal Energy Regulatory Commission (FERC or Commission), which includes a determination that there is a need for the facility and a thorough review of the proposed pipeline route and the environmental impacts associated with the proposed facilities.

### **FERC'S ROLE**

An interstate pipeline cannot be constructed or extended unless FERC issues a certificate of “public convenience and necessity” authorizing the construction and operation. As part of this approval process, the pipeline company must file a detailed project plan with FERC. Among other things, this plan includes all permit applications, maps showing the preliminary pipeline route, a description of the proposed pipeline facilities and up to 12 specific environmental resource reports. These resource reports cover topics such as water use and quality, vegetation and wildlife, cultural resources, socio-economics, geological resources, soils, land use, air and noise quality and project alternatives.

FERC has the authority to approve the pipeline location and construction. It does so through the issuance of a Certificate of Public Convenience and Necessity (Certificate). Before the Commission will authorize construction, it reviews the project to determine if it is in the public interest. This review includes an evaluation of need for the project, and the costs of transporting natural gas by the pipeline. The Commission also conducts an Environmental Assessment or an Environmental Impact Study to evaluate the project’s anticipated impact on the public and the environment.

Part of the Commission’s review process includes public meetings in the communities affected by the project. Announcements of these public meetings are published in local newspapers. The meetings also provide a forum for the local community to ask questions and express comments or concerns about the project.

The time required for the review process varies based on the size of the project, but typically takes six to 18 months from when a company submits an application until the Commission renders its decision whether it will approve a certificate for a project. Once the certificate is issued, the Commission will authorize construction to begin when the conditions established in its certificate order are satisfied.

### **RIGHT-OF-WAY ACQUISITION AND LANDOWNERS**

Pipeline companies are responsible for procuring the land along the proposed route, called a right-of-way.

The acquisition of a pipeline right-of-way often raises many questions with landowners: Why this route for the pipeline? Why is the pipeline needed? What is the procedure for acquiring approval for use of my land? How will I be compensated? How will the land be restored after construction? Can I use the land after the pipeline is installed?

The cornerstone of the right-of-way acquisition process is the negotiation of an easement agreement between the pipeline company and the landowner. This agreement covers key issues such as compensation, restoration of the land and restrictions on future use of the land. A right-of-way agent from the pipeline company contacts each affected landowner along the route to discuss the project and negotiate an easement agreement.

In addition to the permanent easement required to operate and maintain a pipeline after it is constructed, the company also will require a temporary easement during construction. A permanent easement typically is about 50 feet wide and a temporary easement typically will range between 50 to 75 additional feet depending on the size of pipeline; larger pipelines require bigger equipment and more room to operate. The amount of workspace required also depends on the type of terrain that will be crossed and any special construction requirements.



A landowner is compensated a fair market value for the permanent easement, which typically allows the landowner continued use and enjoyment of their property with some limitations. These restrictions typically prohibit structures and trees within the easement in order to preserve safe access of maintenance equipment when necessary and to allow for unimpeded aerial inspection of the pipeline system.

A landowner is generally compensated at a lower rate for a temporary construction easement, because this land reverts back to the landowner after construction for their full use and enjoyment without any restrictions.

Additionally, landowners are compensated for any damages/losses they may incur as a result of the construction across their property, such as loss of crop revenues.

Sometimes, a landowner and a pipeline company may not reach agreement on the terms of an easement. If this happens and FERC has determined that there is a public need for the pipeline, FERC will grant the pipeline company access to the land under eminent domain (the right of the government to take private land for public use). This same right typically is afforded under state and sometimes federal law to electric and natural gas utilities, telecommunications companies, railroads and the transportation infrastructure in the U.S. Under the law governing interstate natural gas pipelines, the Natural Gas Act, this is a federal grant of eminent domain. State or federal courts then supervise the fair compensation and treatment of the landowner.

## **CONSTRUCTION PROCESS**

The pipeline construction process can take up to 18 months.

A pipeline construction project looks much like a moving assembly line. A large project typically is broken into manageable lengths called “spreads,” and utilizes highly specialized and qualified workgroups. Each spread is composed of various crews, each with its own responsibilities that are described below. As one crew completes its work, the next crew moves into position to complete its piece of the construction process. Each spread may be 30 to 100 miles in length, with the front of the spread clearing the right-of-way and the back of the spread restoring the right-of-way.

### *a) Pipeline Size And Design*

The size of interstate pipelines varies, but in most cases a mainline, the principal pipeline that delivers natural gas, ranges from 16 to 48 inches in diameter. Other smaller pipelines called laterals deliver gas to the mainline or take gas from the mainline and range from six to 16 inches in diameter.

The volume of natural gas to be delivered and the pressure at which the pipeline will be operated determine the pipeline's ultimate diameter. In order to meet customer delivery requirements, most interstate natural gas pipelines operate at a pressure of at least 600 pounds per square inch (psi), but typically at about 1,000 psi.



The thickness of the pipeline is determined by the maximum operating pressure (MAOP), and is based on published industry standards and federal regulations. The pipeline incorporates a design safety factor, prescribed by U.S. Department of Transportation (DOT) regulations, that is related to the type of construction and population density along the pipeline route.



### *b) Clearing and Grading*

Before any construction can begin, a survey crew carefully surveys and stakes the construction right-of-way to ensure that only the pre-approved construction workspace is cleared. The clearing and grading crew leads the construction spread. This crew is responsible for removing trees, boulders and debris from the construction right-of-way and preparing a level-working surface for the heavy construction equipment that follows. The crew installs silt fences along the edges of streams and wetlands to prevent erosion of disturbed soil. Trees inside the right-of-way are cut down, and the contractor removes or stacks the timber along the side of the right-of-way depending on the landowner's wishes.

### *c) Stringing*

Natural gas pipelines are separated into segments typically 40 to 80 feet long. A stringing crew uses specialized trailers to move the pipe from a storage yard to the pipeline right-of-way. The crew meticulously monitors the pipeline design plan to ensure that the correct pipeline segments are distributed properly along the pipeline right-of-way, because the type of coating and wall thickness can vary based on soil conditions and location. For example, concrete coating may be used in streams and wetlands, and heavy wall pipe is required at road crossings and in special construction areas.



#### *d) Trenching*

The trenching crew typically uses a wheel trencher or backhoe to dig the pipe trench. DOT requires the top of a pipeline to be buried a minimum of 30 inches below the ground surface. The pipeline must be buried even deeper at river and road crossings.



If the crew finds large quantities of solid rock during the trenching operation, it uses special equipment or explosives to remove the rock. The crew uses explosives carefully, in accordance with state and federal guidelines, to ensure a safe and controlled blast.

In cultivated areas, the topsoil over the trench is removed first and kept separate from the excavated subsoil, a process called topsoiling. As backfilling operations begin, the soil is returned to the trench in reverse order with the subsoil put back first, followed by the topsoil. This process ensures that the topsoil is returned to its original position.



#### *e) Pipe Bending*

The pipe bending crew uses a bending machine to make slight bends in the pipe to account for changes in the pipeline route and to conform to the topography.

The bending machine uses a series of clamps and hydraulic pressure to make very smooth, controlled bends in the pipe. All bending is performed in strict accordance with federally prescribed standards to ensure the integrity of pipe is preserved.

#### *f) Welding*

Welding joins the various sections of pipe together into one continuous length. Special pipeline equipment called a side boom is used to pick up each pipeline segment and align it with the previous segment. The crew then makes the first part (pass) of the weld. The welding crew follows the pipeline along the route until each segment is welded together. Depending on the wall thickness of the pipe, three or more passes may be required to complete each segment weld.

In recent years contractors have used semi-automatic welding units to complete the welding process. Semi-automatic welding, done to strict specifications, still requires qualified welders and personnel to set up the equipment and conduct hand welding at connection points and crossings.



### *g) Coating*

Natural gas pipelines are externally coated to prevent moisture from coming into direct contact with the steel and causing corrosion. This process typically is completed before the pipeline is delivered to the construction site.

All coated pipelines are delivered with uncoated areas three to six inches from each end to prevent the coating from interfering with the welding process. Once the welds are completed, a coating crew coats the remaining portion of the pipeline before it is lowered into the ditch.



Prior to lowering the pipe into the trench, the coating of the entire pipeline is inspected to ensure it is free of defects.



### *h) Depositing the Pipeline*

Lowering the welded pipe into the trench demands close coordination and skilled operators. Using a series of side-booms, which are tracked construction equipment with a boom on the side, operators simultaneously lift and carefully lower the welded pipe sections into the trench. Non-metallic slings protect the pipe and coating as it is lifted and moved into position.

In rocky areas, a contractor may place sandbags or foam blocks at the bottom of the trench prior to placing the pipeline in the trench in order to protect the pipe and coating from damage.

### *i) Backfilling*

With the pipeline successfully laid in the trench, crews begin backfilling the trench. This can be accomplished with either a backhoe or padding machine depending on the soil composition. As with previous construction crews, the backfilling crew takes care to protect the pipeline and coating as the soil is returned to the trench. Soil is returned to the trench in reverse order, with the subsoil put back first, followed by the topsoil. This ensures the topsoil is returned to its original position. In areas where the ground is rocky and coarse, crews screen the backfill material to remove rocks, bring in clean soil to cover the pipeline, or cover the pipe with a protective material to protect it from sharp rocks.





#### *j) Hydrostatic Testing*

Before natural gas is transported through a new pipeline, the entire length of the pipeline is pressure tested using water. This hydrostatic testing is the final construction quality assurance test before the pipeline is put into operation. Requirements for this test are also prescribed in DOT's regulations. Depending on the elevation of the terrain along the pipeline and the location of available water sources, the pipeline may be divided into sections to facilitate the test. Each section is filled with water and pressured up to a level higher than the maximum pressure at which the pipeline will

operate when carrying natural gas. The test pressure is held for a specific period of time to determine if the pipeline meets the design strength requirements and if any leaks are present. Once a section successfully passes the hydrostatic test, water is emptied from the pipeline and the pipeline is dried to ensure that no water is present when natural gas begins to flow.

#### *k) Restoration*

The final step in the construction process is to restore the right-of-way and easement land as closely as possible to its original condition. Depending on the requirements of the project, this process typically involves such things as replacing topsoil, removing large rocks that may have been brought to the surface, completing any final repairs to irrigation systems or drain tiles, spreading lime or fertilizer, restoring fences, etc. The restoration crew carefully grades the right-of-way. In hilly areas, the crew installs erosion prevention measures such as interceptor dikes, which are small earthen mounds constructed across the right-of-way to divert water. The restoration crew also installs riprap, consisting of stones or timbers, along streams and wetlands to stabilize soils. As a final measure, the crew may plant seed and mulch the construction right-of-way, to ensure that foliage and grassland are restored as close as possible to their original condition.



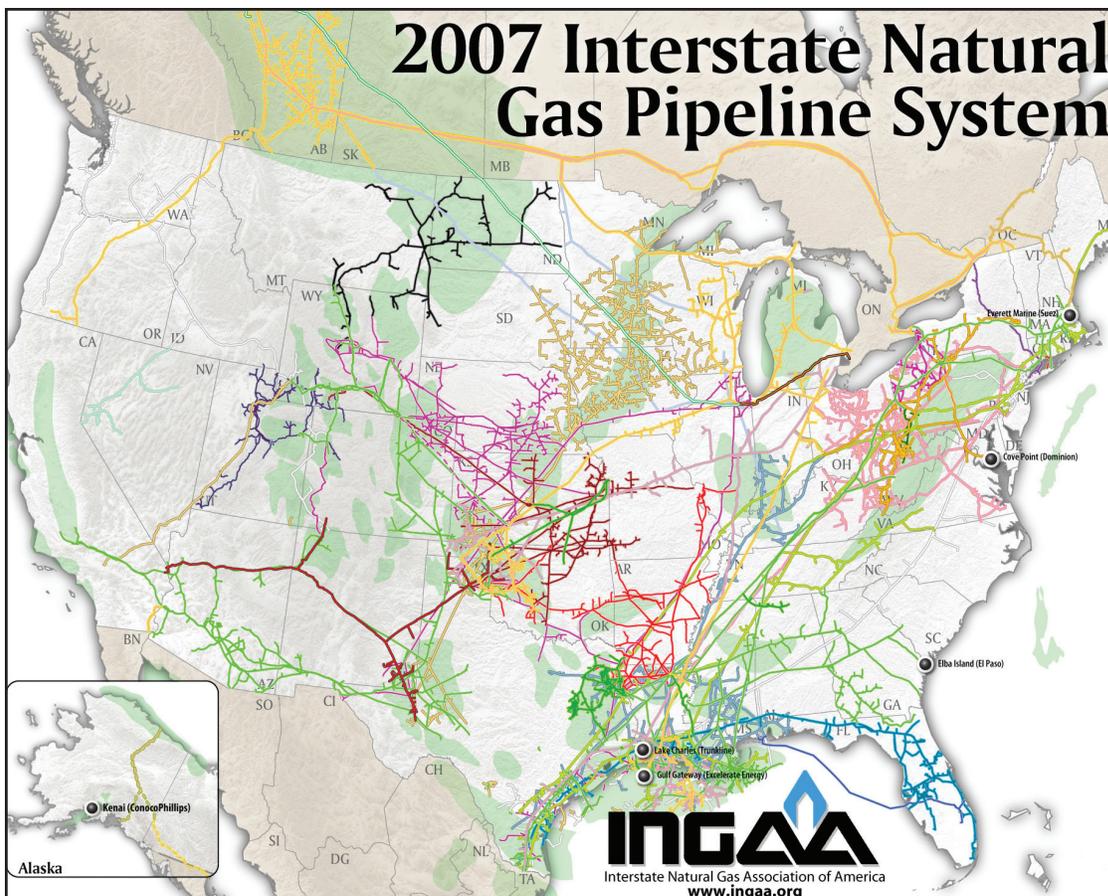
# I.b

## PIPELINE OPERATIONS

### HOW THE INTERSTATE PIPELINE SYSTEM WORKS

Natural gas is a naturally occurring hydrocarbon that consists mostly of methane. It is usually found in underground formations of porous rock, and can be found either alone or in association with oil. During the production process, wells are drilled into the porous rock and pipes are used to bring the natural gas to the surface. In most wells, the pressure of the natural gas is enough to force it to the surface and into the gathering lines.

Gathering lines link production areas to central collection points. Some natural gas gathering systems include a processing facility, which removes natural gas liquids, impurities such as water, carbon dioxide or sulfur that might corrode a pipeline, and inert gases such as helium that could reduce the energy value of the gas.



The pipeline transportation system, the “interstate highway” for natural gas, consists of 220,000 miles of high-strength steel pipe 20 inches to 42 inches in diameter. It moves huge amounts of natural gas thousands of miles from producing regions to local natural gas utilities and sometimes directly to large users of natural gas. Compressor stations every 75 to 100 miles boost the pressure that is lost through the friction of gas moving through steel pipe.

Local distribution companies are the “city streets” for natural gas. This is where meters measure the gas and where a sour-smelling odorant is added to help customers smell even small quantities of natural gas. The local gas company then uses distribution pipes, or “mains,” to bring natural gas service to most U.S. homes and nearly 5 million businesses. To help ensure reliable service, local natural gas companies can store natural gas underground for use during peak demand, such as cold days. In some cases, the storage is within the local distribution system. In most cases, large volume underground storage facilities are connected to the interstate pipeline network. On average, underground storage accounts for about 20 percent of the natural gas consumed each winter.

## SYSTEM COMPONENTS

### *Line Pipe*

The component we probably think about first in a gas pipeline is the pipe itself. Line pipe, as it is called, is manufactured from high-strength carbon steel, and is made to strict engineering and metallurgical specifications developed by the American Petroleum Institute (API).

One particular standard, API Specification 5L, defines requirements for pipe made to transport natural gas, oil and water. This specification includes standards for the dimensional, physical, mechanical, and chemical properties of the carbon steel. Several pipe mills in North America and around the world manufacture API 5L line pipe for the natural gas industry. Pipe mills produce two types of line pipe: seamless and welded.



Seamless pipe is formed from a cylindrical bar of steel that is heated to a very high temperature and then is pierced with a probe to create the hole through the cylinder. Rollers size the cylinder to produce the proper diameter and wall thickness. This technique is used to make small diameter pipe, from 0.5 inches to 24 inches in diameter.

Most pipe produced for interstate natural gas pipelines is the welded variety, because interstate systems require larger diameter pipe. Pipe mills manufacture line pipe by forming a steel plate or coil into a cylindrical shape, and closing the seam using a welding process. The mill evaluates the quality of the weld seam using ultrasonic and/or radiological inspection methods and pressure tests each joint of pipe to levels significantly higher than the eventual operating pressure of the pipeline. The pipe is further tested to ensure that it meets all requirements of steel chemistry, strength and toughness, and dimensional characteristics. Mills that produce line pipe to API specifications meet the most stringent criteria for steel making and pipe production technologies to ensure safe, reliable pipeline service. The natural gas pipeline industry maintains the manufacturing and test records of the pipe for the life of the pipeline.

### *Pipe Coating*

Coating mills apply pipe coatings to protect the line pipe from corrosion. Often, the coating mill is located adjacent to the pipe mill, so line pipe moves directly from the pipe manufacturer to the coating facility.



The natural gas industry uses several different types of pipe coatings. Historically, pipeline companies coated pipe with coal tar enamel or an enamel tape wrap. Today a fusion bond epoxy (FBE) coating is used most widely. FBE coating can be recognized by its light blue color, often seen on pipe being transported by rail or truck. Regardless of the type of coating used, the purpose is the same: prevent external corrosion by prohibiting moisture from coming into direct contact with the metal.

To prepare for fusion bond epoxy coating, the external surface of the pipe is thoroughly cleaned with a shot-blast process. The pipe is then heated to a prescribed temperature and an epoxy powder is applied. The powder “melts” onto the heated pipe and forms a water tight barrier. Prior to transporting the pipe to the job site, the mill tests the coated pipe with high voltage electricity to evaluate the coating’s insulating effectiveness.

In some cases, internal pipeline coating is used to increase the efficiency of transporting natural gas by reducing friction.

### *Compressor Stations*

The compressor station, also called a pumping station, is the “engine” that powers an interstate natural gas pipeline. As the name implies, the compressor station compresses the natural gas (pumping up its pressure) thereby providing energy to move the gas through the pipeline.



Pipeline companies install compressor stations along a pipeline route, typically every 40 to 100 miles. The size of the station and the number of compressors (pumps) varies, based on the diameter of the pipe and the volume of gas to be moved. Nevertheless, the basic components of a station are similar.

There are three commonly used types of engines that drive the compressors and are known as “prime movers”:

**Turbine/Centrifugal Compressor:** This type of compression unit uses a natural gas-fired turbine to turn a centrifugal compressor. The centrifugal compressor is similar to a large fan inside a case, which pumps the natural gas as the fan turns. A small portion of natural gas from the pipeline fuels the turbine.



**Electric Motor/Centrifugal Compressor:** In this package, the centrifugal compressor is driven by a high voltage,



electric motor. One advantage of electric motors is that there is no need for an air emission permit, since no hydrocarbons are burned as fuel. Still, a highly reliable source of electric power must be available near the station for such units to be considered for an application.

**Reciprocating Engine/Reciprocating Compressor:** These piston engines resemble automobile engines, only many times larger. Commonly known as “recips,” these engines are fueled by natural gas from the pipeline. Reciprocating pistons, located in cylinder cases on the side of the unit, compress the natural gas. The compressor pistons and the power pistons are connected to a common crankshaft. The advantage of reciprocating compressors is that the volume of natural gas pushed through the pipeline can be adjusted incrementally to meet small changes in customer demand.



### *Metering Stations*

For a pipeline company to manage its natural gas pipeline system efficiently, it must know how much gas is in the system at all times. This can be a daunting task, as pipeline systems often extend over thousands of miles. To accomplish this, pipeline companies use metering stations to measure all natural gas entering or exiting the pipeline system. A meter station may use



- ▶ orifice meters,
- ▶ turbine meters,
- ▶ ultrasonic meters, or
- ▶ positive displacement meters

to measure the gas flow. The metering facilities must provide accurate and continuous natural gas measurement.



Some meter stations also regulate natural gas pressure and delivery volumes and are called meter and regulator stations (M&R). Pressure regulation equipment ensures that natural gas delivered into or out of a pipeline system is maintained within a specified pressure range. This is important for safety reasons, because transportation and distribution systems are designed to operate within specific pressure ranges.

### *Liquid Separators*

As the pipeline enters the compressor station the natural gas passes through scrubbers, strainers or filter separators. These are vessels designed to remove any free liquids or dirt particles from the gas before it enters the compressors. Though the pipeline is carrying “dry gas,” some water and hydrocarbon liquids may condense out of the natural gas stream as the gas cools and moves through the pipeline. Any liquids that may be produced are collected and stored for sale or disposal. A piping system directs the natural gas from the separators to the gas compressors.



### *Mainline Valves*

Pipeline companies install valves along a natural gas pipeline system to provide a means of controlling flow. The valves may be spaced as close

together as every five miles or as far apart as 20 miles according to standards established by applicable safety codes. The valves normally are open, but when a section of pipeline requires maintenance, operational engineers close the valves to isolate that section of the pipeline. Once isolated, the maintenance crew can vent the natural gas from that section of the pipeline and proceed with its work.

### *Natural Gas Storage Fields*

Historically, storage was used to respond to the peak needs of cold winter days or respond to supply disruptions. This is when pipelines would typically move large quantities of natural gas for their customers. In the past, summer demand for natural gas was lower, so pipeline deliveries were lower. In recent years, however, mostly due to increased demand from natural gas-fired electric power plants, demand is peaking in the summer. Because of this shift, well-placed natural gas storage has become even more important to natural gas operations.

Natural gas storage plays a key role in balancing supply and demand, particularly during peak-demand periods.

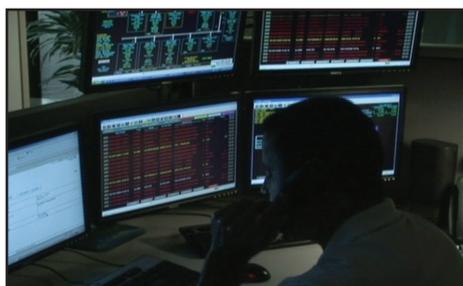
Today, North American natural gas storage plays a key role in balancing supply and demand, particularly consumption during peak-demand periods. Storage can reduce the need for both swing natural gas production deliverability and pipeline capacity by allowing production and pipeline throughput to remain relatively constant. Customers may use storage to reduce pipeline demand charges, to hedge against natural gas price increase, or to arbitrage gas price differences. Pipelines and LDCs use storage for operational flexibility and reliability, providing an outlet for unconsumed natural gas supplies or a source of natural gas to meet unexpected demand. Storage at market trading hubs often provides balancing, parking, and loan services. In the future, additional conventional storage will be needed to meet growing seasonal demands and high deliverability storage will be required to serve fluctuating daily and hourly power plant loads.

Most natural gas storage fields are depleted natural gas reservoirs, but some storage fields have been created by leaching underground caverns in salt domes. Both types of storage fields are extremely safe. In either case, the pipeline company injects natural gas into the storage field when demand is low and withdraws it from the storage field during times of high demand.

See the following section for a more detailed discussion about natural gas storage.

### *Supervisory Control and Data Acquisition (SCADA)*

Pipeline companies use a specialized communication system to monitor and control certain equipment on the natural gas pipeline. Referred to as Supervisory Control and Data Acquisition, or SCADA, this system



regularly transmits operating status, flow volumes, pressure and temperature information from compressor stations, M&R stations and valves to a centralized gas control facility. Pipeline companies use microwave communication systems, satellites and conventional telephone lines to transmit this information. In addition to monitoring the pipeline on a real-time basis, the SCADA system may also allow an operator in the interstate pipeline's gas control room, or other location, to start and stop some compressor station facilities remotely.



## OVERVIEW

Natural gas customers benefit from the capability to store natural gas, primarily in underground facilities, until it is needed in response to market demands caused by weather or other events. There currently are nearly 400 underground storage facilities in the United States owned and operated by various companies.

Natural gas storage adds flexibility to the natural gas transportation network and has many uses. Natural gas transportation generally is a seasonal business. Shippers want to inject natural gas into storage when demand is low – historically in the summer – and withdraw it during times of high demand – generally to meet peak heating demands in winter. (Natural gas from storage accounts for about 20 percent of the natural gas consumed in the winter.) Shippers sometimes use natural gas from storage in the summer to meet gas-fired electric generation needs.

The ability to store natural gas contributes to the high reliability of natural gas. Through sophisticated computerized information and transaction systems and flexible daily and intra-daily scheduling, shippers can use natural gas from storage to increase available supply in the system and maximize use of pipeline capacity during peak demand periods. The additional supply drawn from storage meets shippers' needs and dampens the price volatility that might otherwise occur because of the tight balance of supply and demand within a particular market.

Like pipeline capacity, there are physical limits on existing storage capacity, and new and expanded natural gas storage facilities are needed. Still, new storage, alone, is not a complete answer to supply-demand imbalances in the North American natural gas market. In many cases, new storage cannot take the place of new pipeline capacity needed to link natural gas supply to consuming markets. For example, in some regions, such as the Northeast, the geology does not support the development of underground natural gas storage. By necessity, underground storage facilities serving this region will be many miles from the load centers and will be reliant on sufficient pipeline capacity to transport natural gas to consumers. Therefore, when pipeline capacity constraints become binding (i.e., when all existing pipeline capacity is being fully utilized due to cold weather or increased natural gas demand for electric power generation), natural gas in storage may not be deliverable to the consuming market unless a firm transportation path has been reserved.

## TYPES OF NATURAL GAS STORAGE

While natural gas may be stored under pressure in a number of ways, the four most common types of storage facilities are (1) depleted reservoirs in oil and/or natural gas fields, which represent the majority of natural gas storage; (2) aquifers; (3) salt cavern formations; and (4) above ground storage in liquefied natural gas (LNG) facilities. Each type of natural gas storage is extremely safe.

### I. Underground Natural Gas Storage Fields

Each underground storage type has its own physical characteristics (porosity, permeability, and retention capability) and economics (site preparation and maintenance costs, deliverability rates, and cycling

capability) which affect its suitability for particular applications. Three of the most important characteristics of an underground storage reservoir are (1) its capacity to hold natural gas for future use, 2) the rate at which natural gas inventory can be withdrawn - its deliverability rate - and 3) the amount of base (cushion) gas needed to be kept permanently in the reservoir for storage to operate correctly.

**Depleted Natural Gas or Oil Fields:** Most existing storage in the United States is in depleted natural gas or oil fields. Conversion of a field from production to storage takes advantage of existing wells, gathering systems, and pipeline connections. Depleted oil and natural gas reservoirs are the most commonly used underground storage sites because of their wide availability. Depleted production fields located close to natural gas consuming centers are the most valuable, because this proximity reduces the need for long haul pipeline transportation.

**Aquifers:** In some areas, most notably the Midwest, natural aquifers have been converted to natural gas storage reservoirs. An aquifer is suitable for storage if the water bearing sedimentary rock formation is overlaid with an impermeable cap rock. While the geology is similar to a depleted production field, the use of an aquifer for storage usually requires more base (cushion) gas and greater monitoring of withdrawal and injection performance. Deliverability rates may be enhanced by the presence of an active water drive.

**Salt Caverns:** The large majority of salt cavern storage facilities have been developed in salt dome formations in the Gulf Coast states. Salt caverns provide very high withdrawal and injection rates relative to their working natural gas capacity. Base natural gas requirements are relatively low. Cavern construction is more costly than depleted field conversions when measured on the basis of dollars per thousand cubic feet of working natural gas capacity. Still, compared to a depleted field or an aquifer, the ability of a salt cavern storage facility to perform several withdrawal and injection cycles each year reduces the per-unit cost of each thousand cubic feet of natural gas injected and withdrawn.

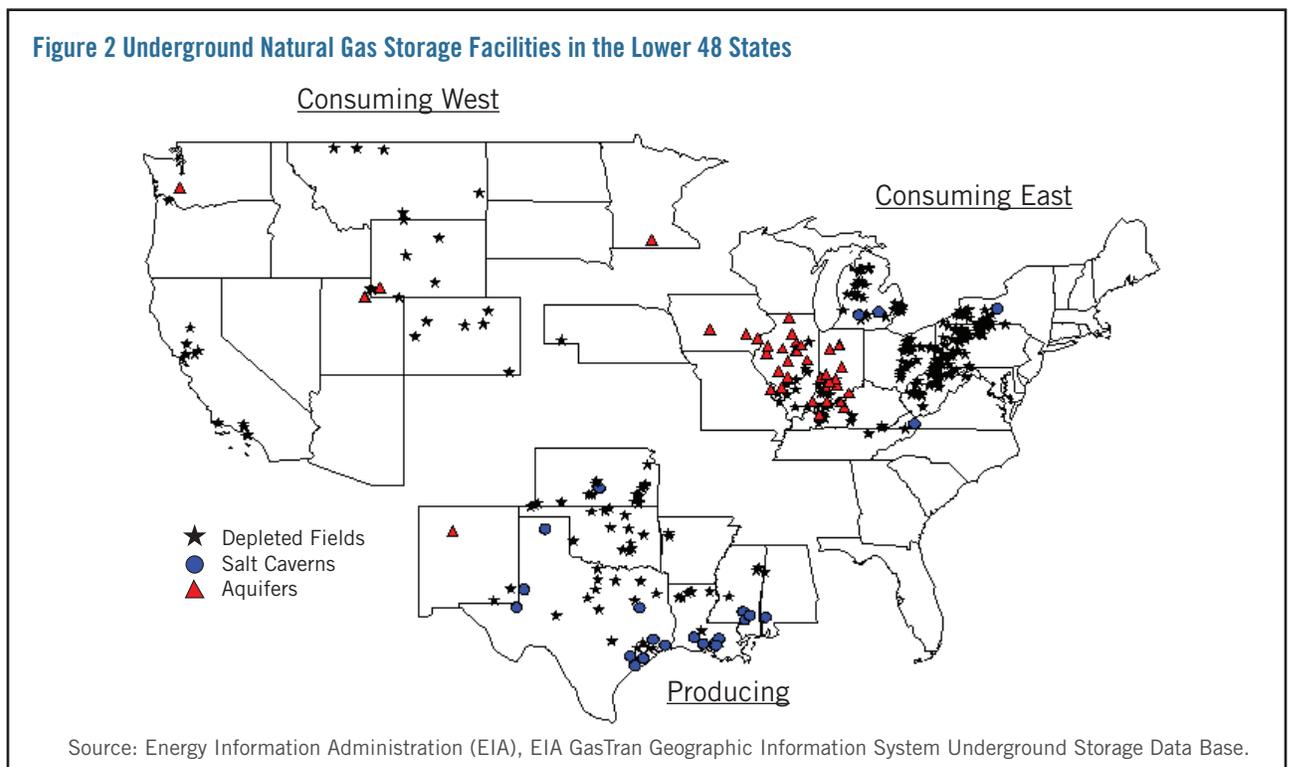
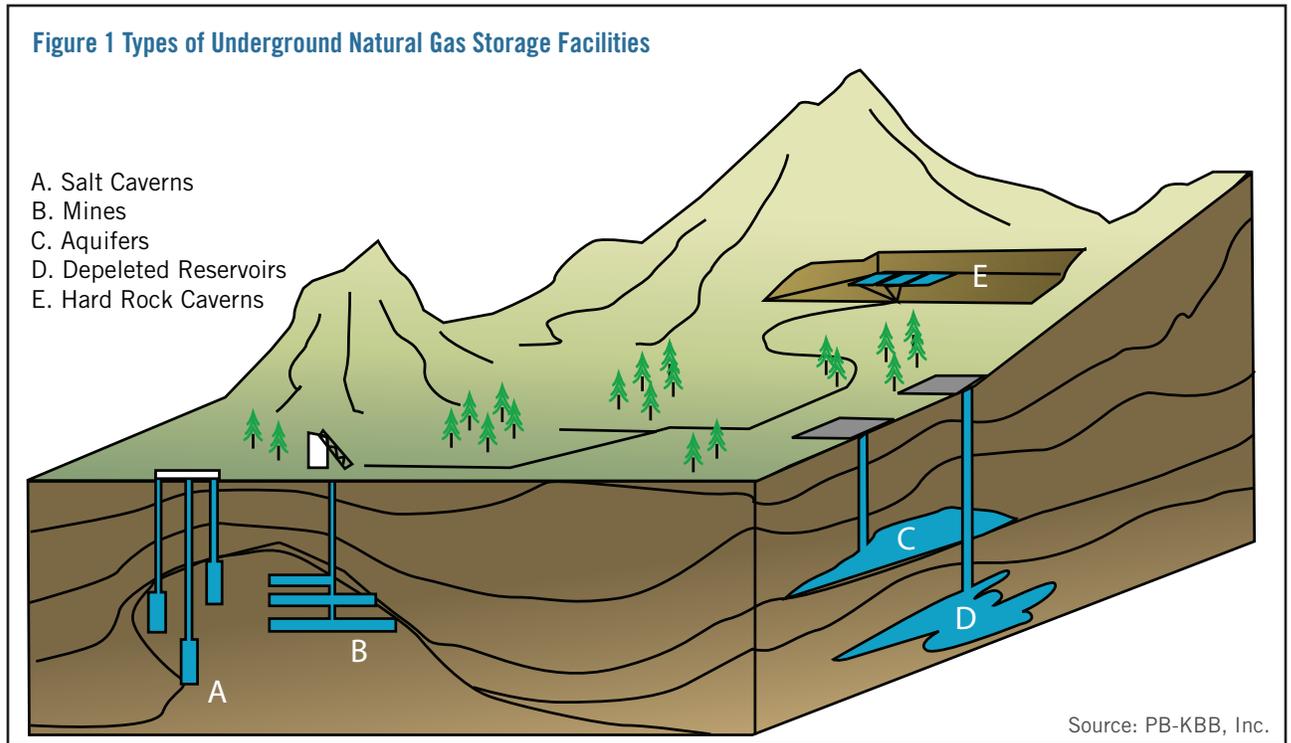
#### *Owners and Operators of Underground Storage Fields*

The principal owners/operators of underground natural gas storage facilities are (1) interstate pipeline companies, (2) intrastate pipeline companies, (3) local distribution companies (LDCs), and (4) independent storage service providers. About 120 entities currently operate the nearly 400 active underground storage facilities in the lower 48 states. In turn, these operating entities are owned by, or are subsidiaries of, fewer than 80 corporate parents. If a storage facility serves interstate commerce, it is subject to FERC jurisdiction; otherwise, it is state-regulated.

Owners/operators of storage facilities are not necessarily the owners of the natural gas held in storage. Indeed, most working natural gas storage capacity is leased to LDCs, end-users or marketers who own the gas. Still, the type of entity that owns/operates the facility often is indicative of how that facility's storage capacity is utilized.

- 1) **Interstate pipeline companies** rely heavily on underground storage to facilitate load balancing and system supply management on their long haul transportation pipelines. With implementation of FERC Order No. 636, jurisdictional pipeline companies were required to operate their storage facilities, as well as their pipelines, on a non-discriminatory open-access basis. That is, the major portion of working natural gas capacity (beyond what may be reserved by the pipeline/operator to maintain system integrity and for load balancing) at each site must be made available for lease to third parties on a non-discriminatory basis. (See Tab III.a for a description of FERC Order No. 636.)

Figure 1 is a stylized representation of the various types of underground storage facilities, while Figure 2 shows the location of the nearly 400 active storage facilities in the lower 48 states.



- 2) Intrastate pipeline companies use storage capacity and inventories for similar purposes, in addition to serving end-user customers. Also, in some states, intrastate pipelines remain in the merchant function (i.e., purchasing and selling natural gas at wholesale) and utilize storage for their own gas inventory.
- 3) LDCs historically have used underground storage exclusively to serve the needs of their retail customers directly. Now, however, some state restructuring rules have made it possible for LDCs to realize additional revenues by making storage services available to third parties.
- 4) Independent storage service providers have developed many salt dome storage facilities and other high deliverability sites. These providers, often smaller companies, have been started by entrepreneurs who have focused on the potential profitability of specialized storage facilities. The facilities are utilized almost exclusively to serve third-party customers such as marketers and electricity generators who can benefit the greatest from the opportunities created by high deliverability storage.

The restructuring of the natural gas industry at both the federal (i.e., wholesale) and state (i.e., retail) levels has created new opportunities for storage operators to offer services and for natural gas customers to take advantage of such services. As part of the restructuring, natural gas services offered by pipelines, and in some cases LDCs, have been unbundled and offered to customers on a non-discriminatory open-access basis. At the same time, barriers to entry have fallen and it has become possible for independent third-parties to enter the natural gas storage business. Finally, in some cases, regulators have approved market-based rates (i.e., for practical purposes, deregulated rates) for storage, which create additional incentive for the development of storage facilities because services can be structured and priced in ways to capture value that are not available with regulated, cost-based rates.

#### *Uses of Underground Storage* “Open Access” to Storage Capacity

Prior to 1994, interstate pipeline companies, which are subject to FERC jurisdiction, owned a significant part of the natural gas flowing through their systems, including gas held in storage, and had exclusive control over the utilization of their storage facilities. With the implementation of FERC Order No. 636, jurisdictional pipeline companies were required to operate their pipelines and storage facilities on an open-access basis. (See Tab I.c, II.a and III.a for more information on open access requirements.) That is, the major portion of working natural gas capacity (beyond what may be reserved by the pipeline/operator to maintain system integrity and for load balancing) at each site must be made available for lease to third parties on a non-discriminatory basis. Today, in addition to the interstate storage sites, many storage facilities owned/operated by large LDCs, intrastate pipelines, and independent operators also operate on an open-access basis. Open access has created opportunities for storage to be used as more than simply backup inventory or a supplemental seasonal supply source.

#### Shifts in Storage Use Affect Inventories and Injection and Withdrawal Cycles

The natural gas industry has experienced significant changes in inventory management practices and storage utilization over the past decade or more as a result of market restructuring. During that time, the operational practices of many U.S. underground storage sites became much more market oriented and seasonal factors now are less important than in the past.

Historically, storage was used to ensure security of supply during the winter heating season, i.e., natural gas was injected into storage during the off-peak months and was withdrawn during the peak winter heating season. Now, in addition to the security of supply function, storage is used by marketers and others to take

advantage of price arbitrage opportunities. Storage also can be used in conjunction with financial instruments (e.g., futures and options contracts, swaps, etc.) as part of risk management products offered to natural gas users. Another factor that has affected storage use is the increase in natural gas-fired electric generation.

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Reflecting this change in focus within the natural gas storage industry, the largest growth in daily withdrawal capability has been from high deliverability storage sites, which include salt cavern storage reservoirs as well as some depleted oil or natural gas reservoirs. These facilities can cycle their inventories (i.e., completely withdraw and refill working natural gas) more rapidly than can other types of storage. This feature makes such facilities more suitable to the flexible operational needs of today's storage users and creates far more opportunities for storage operators and customers to profit from storage services. Since 1993, daily withdrawal capability from high deliverability salt cavern storage facilities has grown significantly. Nevertheless, conventional storage facilities remain very important to the industry as well.

#### *EIA Underground Natural Gas Storage Data*

The Energy Information Administration (EIA) collects a variety of data on storage utilization, and publishes selected data on a weekly, monthly, and annual basis. (To access this information, go to the EIA website at [www.eia.doe.gov](http://www.eia.doe.gov); click on "Natural Gas".) For example, EIA uses Form EIA-912, Weekly Natural Gas Storage Report, to collect data on end-of-week working natural gas in storage at the company and regional level from a sample of all underground natural gas storage operators. The sample is drawn from the respondents to the EIA-191, Monthly Underground Gas Storage Report, which, among other things, collects data on total capacity, base gas, working gas, injections, and withdrawals, by reservoir and storage facility, from all underground natural gas storage operators. Data from the EIA-912 survey is tabulated and published at regional (see Figure 2 for depiction of regions) and national levels on a weekly basis. Data derived from the EIA-191 survey is published on a monthly basis in the Natural Gas Monthly. The data include tabulations of base gas, total inventories, total storage capacity, injections, and withdrawals at state and regional levels. Figure 3 depicts some basic storage statistics compiled by EIA.

## **II. Liquefied Natural Gas (LNG) Facilities (Above Ground Tanks)**

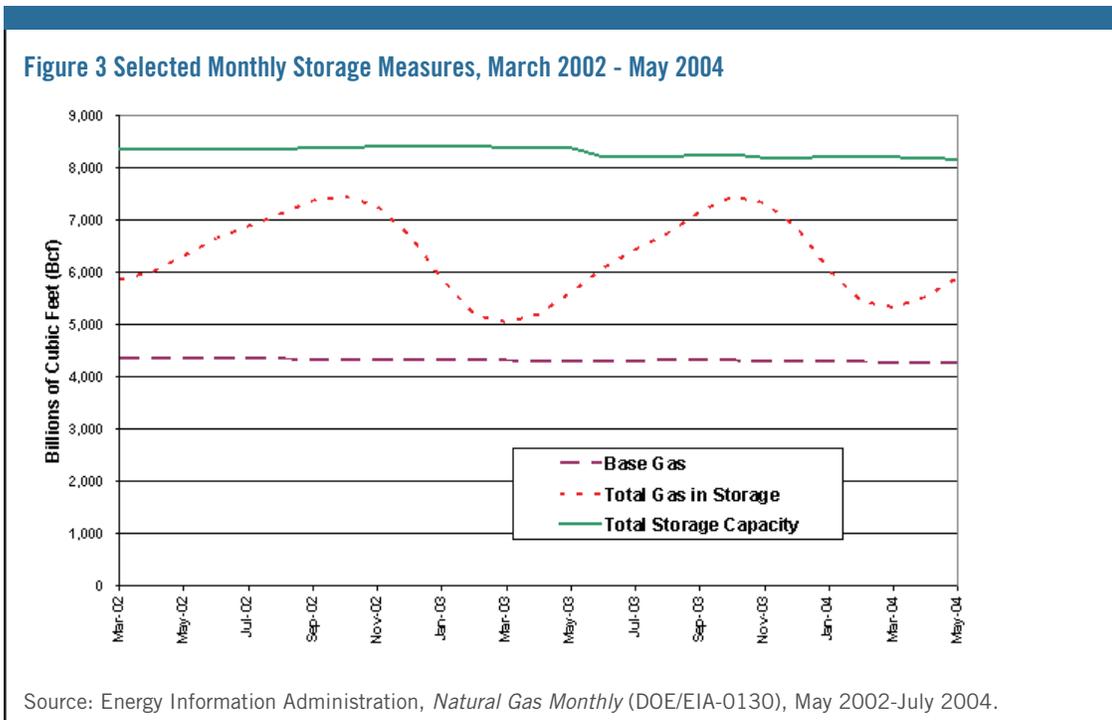
Another way to store natural gas is to convert the gas to a liquid and store it in above ground tanks. When natural gas is cooled to -260 degrees Fahrenheit, it becomes a liquid, commonly known as liquefied natural gas or LNG.

As with underground storage, pipeline companies and LDCs use LNG storage facilities to increase deliveries during periods of peak demand. When the pipeline or LDC needs natural gas, it warms the LNG, causing it to quickly vaporize (a process called re-gasification) and flow into the pipeline for delivery to customers.

LNG has particular storage and transportation benefits due to the huge reduction in volume that occurs

when natural gas is transformed from a gaseous state to a liquefied state. Comparing equivalent amounts of natural gas and LNG, the LNG occupies 600 times less space (than the gaseous form). This allows for much larger quantities of LNG to be stored in a given space.

For more information about LNG, please see the EIA report, [The Global Liquefied Natural Gas Market: Status & Outlook](#). (This report can be accessed on the EIA website, [www.eia.doe.gov](http://www.eia.doe.gov), by conducting a Glossary search for “LNG”.)





## II. Natural Gas Restructuring: The Framework for a Competitive Wholesale Natural Gas Market



The Interstate Natural Gas Association of America



II. Natural Gas Restructuring: The Framework for a Competitive Wholesale Natural Gas Market

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## II.a

# HISTORY OF NATURAL GAS REGULATION<sup>1</sup>

### THE NATURAL GAS ACT (NGA)

Federal regulation of the interstate natural gas pipeline industry began with the passage of the NGA in 1938. See 15 U.S.C. §§ 717-717w. (See Tab III.c for a description of the NGA.) At the time, pipelines generally contracted to buy gas from producers and then, under separate contracts, transported and sold it to local distribution companies (LDCs) and industrial and other customers connected directly to their systems. Rather than following the “common carriage” model of regulation first adopted in the Interstate Commerce Act for railroads, under which private contracts were barred in favor of a uniform schedule of rates, the NGA sought to regulate the natural gas pipeline industry within its existing contract-based structure. Thus, the NGA required pipelines to file and make public their contracts, and to give notice of any proposed rate or service changes, but gave the the Federal Power Commission (FPC), the predecessor of the current Federal Energy Regulatory Commissions (FERC), the authority to set aside any rate or contract for interstate transportation or sale of natural gas for resale that it found “unjust, unreasonable or unduly discriminatory.” Under the NGA, a pipeline could not “abandon” a service, even after its customer’s contract had expired, without first obtaining the FPC’s approval. Under an amendment that was part of the 1942 War Powers Act, Congress gave the FPC authority to approve the construction of new interstate pipelines by issuing certificates of “public convenience and necessity” (PC&N).

Initially, FPC regulation focused on setting rates and conditions for interstate pipelines’ transportation and resale of gas to local customers. In 1954, however, the Supreme Court ruled that the FPC’s jurisdiction extended to prices that producers charged pipelines for gas at the wellhead. The producer price regulation that followed is widely viewed as the cause of supply shortages in the interstate market that persisted into the 1970s.

### THE BEGINNING OF GAS PRICE DEREGULATION

In 1978, Congress responded to the shortages by passing the Natural Gas Policy Act (NGPA) and the Powerplant and Industrial Fuel Use Act (Fuel Use Act). (Congress also created FERC, thereby replacing the FPC, as part of the several energy laws enacted during the Carter administration.) The NGPA gradually phased out federal controls over most natural gas prices, but in the interim established a statutory schedule of relatively high prices as an incentive for producers to bring new supplies of natural gas to the market. To dampen demand, the Fuel Use Act prohibited the use of natural gas as a boiler fuel for utility and industrial power generation. (Congress repealed the Fuel Use Act in 1987.)

### THE TAKE-OR-PAY ISSUE

Pursuant to FPC and later FERC regulations, and in order to guarantee their customers’ access to firm supplies of gas during supply shortages, pipelines created portfolios of gas sources by signing long-term contracts with different producers. Those contracts typically contained “take-or-pay” provisions which

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<sup>1</sup> The following cases provide additional details regarding the history set out here: *United Gas Co. v. Mobile Gas Corp.*, 350 U.S. 332 (1956); *United Distrib. Cos. v. FERC*, 88 F.3d 1105, 1121-27 (D.C. Cir. 1996); *Associated Gas Distribs. v. FERC*, 824 F.2d 981, 993-97 (D.C. Cir. 1987).

required the pipelines to pay for specified quantities of gas regardless whether they actually took delivery. Both producer-pipeline and pipeline-end-user contract prices were often tied to the inflation-indexed NGPA statutory maximum lawful price. During the early to mid-1980s, the prices pipelines charged their customers began to rise as the more expensive “new” natural gas under the NGPA’s complicated regulatory scheme increased as a percentage of the pipelines’ portfolio of natural gas supplies. At the same time, producers responded to the take-or-pay contract guarantees and higher NGPA-sanctioned prices by producing more natural gas, so that the supply shortage of the 1970s gave way to the “gas bubble” of the 1980s. In addition, fuel switching in the industrial sector pursuant to the Fuel Use Act, as well as conservation, dampened the demand for natural gas. As a result of these regulatory and economic cross currents, many pipelines found themselves with large portfolios of unmarketable high-priced natural gas along with accumulating take-or-pay liability to producers.

Other developments exacerbated pipeline take-or-pay problems. In 1985, an appellate court struck down FERC-sanctioned special marketing programs, which would have enabled pipelines to increase their sales and obtain some relief from their liability to producers by selling natural gas at discounted rates to customers that had the ability to switch to other fuels. In addition, as described in the next section, FERC initiated a restructuring of interstate pipeline companies in the mid-1980s, one facet of which was to relieve the pipelines’ customers of their contractual obligations to purchase natural gas from pipelines, without affording corresponding relief to the pipelines from their take-or-pay obligations to producers.

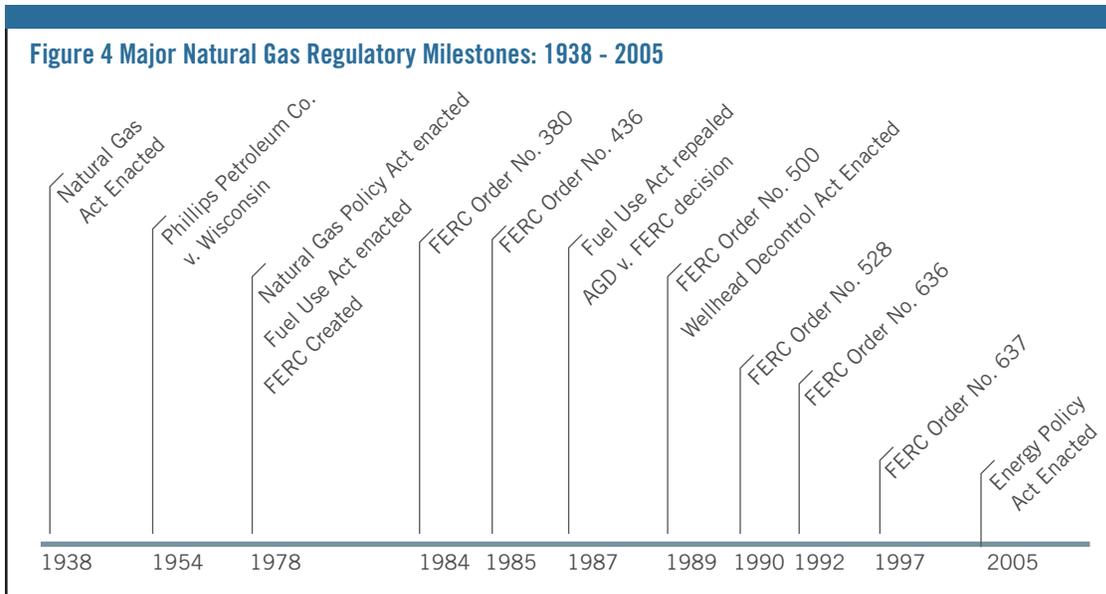
#### **“OPEN ACCESS” AND THE “UNBUNDLING” OF PIPELINE SALES AND TRANSPORTATION**

In the mid 1980s, FERC began a major restructuring of pipeline companies’ services, with the ultimate goal of enabling consumers to purchase gas directly from producers in a competitive market for natural gas. Thus, in 1984, FERC issued Order No. 380, which barred pipelines from including “minimum bill” clauses in their contracts that obligate customers to purchase a minimum quantity of gas from the pipeline. In 1985, FERC issued Order No. 436, which offered pipelines a choice: pipelines could opt to accept “blanket certificates,” which would permit them to initiate new services without having to obtain a certificate of PC&N for each one, along with the ability to price services within a maximum-minimum price band. In return, pipelines were obligated to provide “open access” transportation, i.e., to transport gas on the same terms for customers regardless whether the pipeline or another source was the gas seller, and to allow their LDC customers to convert contractual commitments to purchase gas from the pipeline to an obligation to use the pipeline’s transportation service. FERC’s central idea was to unbundle the pipelines’ sales and transportation services. In view of competitive pressures on the industry, virtually all pipelines opted “voluntarily” to become open access transporters in what the reviewing court later compared to a condemned man’s choice “between the noose and the firing squad.” *AGD v. FERC*, 824 F.2d 981, 1024 (D.C. Cir. 1987).

Although the AGD court affirmed major provisions of Order No. 436, the court found merit in the pipelines’ major grievance; the court ruled that releasing customers from their obligations to purchase gas from pipelines unfairly left the pipelines stranded with their portfolios of high cost take-or-pay contracts with producers, and remanded the case. FERC responded with the Order Nos. 500 and 528, which, among other actions, required that producers provide take-or-pay credits for pipeline transportation, established a mechanism for pipelines to recover from their customers some of the costs of renegotiating their take-or-pay liability, and authorized pipelines to assess a gas inventory charge to compensate them for standing ready to supply gas to sales customers.

Order No. 636, issued in 1992, made the unbundling of pipelines’ merchant and transportation services mandatory. Services are now priced separately, and customers can choose and pay for only the services they need. FERC conferred substantial new rights on customers holding firm capacity. Firm capacity holders

have the freedom to release their unneeded firm pipeline capacity for sale to other customers, and they may subdivide their capacity into segments for their own use or for release to other shippers. In addition, FERC expanded firm capacity holders' rights so that they can receive and deliver gas to or from any point within the path of their firm capacity. Order No. 636 also eliminated a three-year rate review requirement that grew out of the pipeline's earlier role as a reseller of natural gas. Order No. 637, issued in 1997, further enhanced pipeline capacity holders' segmentation and flexible point rights.



### THE CURRENT STATE OF THE INDUSTRY

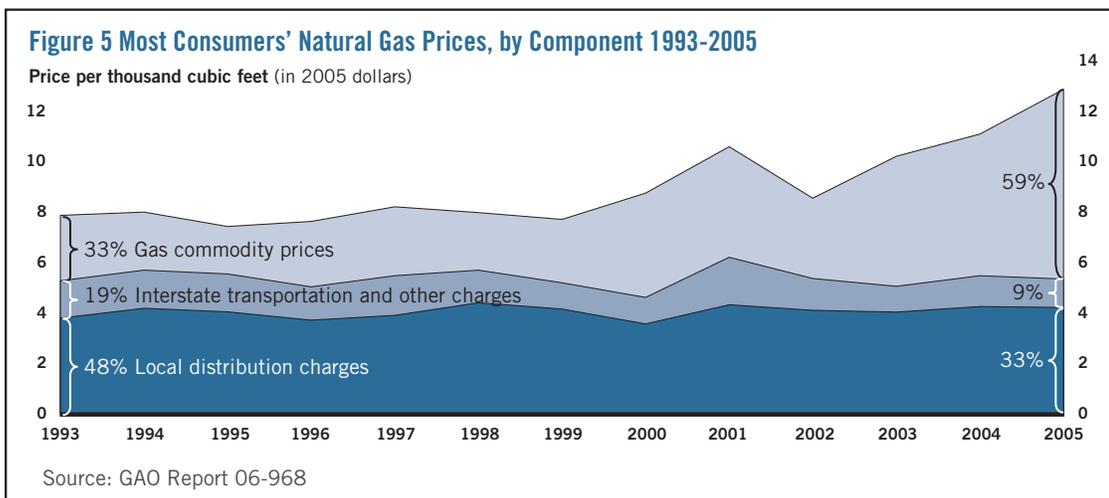
The U.S. natural gas market now has over 15 years experience operating under the Order No. 636 restructuring. The competitive culture fostered by Order No. 636 has replaced the public utility culture of the pre-restructuring natural gas industry. It now is imperative for pipelines to manage costs because there is no guarantee of cost recovery. Overall, the result is a far more efficient natural gas market that has provided many benefits to interstate pipeline customers of all kinds – LDCs, direct end-use customers, electric generators, marketers, and producers – as well as natural gas consumers at the burner tip.

For example:

- ▶ The reliability of interstate pipeline service has been maintained. The industry responded successfully to a cold snap of historic proportions in January of 1994, and the severe winter of 1995-1996 by operating without significant service disruptions. The 2005 Gulf Hurricanes are another example. Despite sustaining significant damage from the storms, the pipeline industry nonetheless was able to maintain deliveries with only a handful of mostly localized (Gulf region) service interruptions.
- ▶ Pipeline management has responded to the more competitive environment by creating new, market-responsive services and by taking advantage of developments in computer and communications technology. The industry has added significant new pipeline capacity since Order No. 636. Pipelines compete vigorously to attach new supply sources and to serve new markets. As

pipeline shippers take advantage of the competitive alternatives offered by restructuring, pipelines compete to fill excess capacity and frequently discount their maximum tariff rates to optimize capacity utilization.

- ▶ Elimination of the three-year rate refiling requirement ended an incentive for pipelines and their customers to play “rate case games” with spending and cost containment decisions. For the past decade, pipeline rates generally have remained constant in nominal dollars and have actually gone down in real (i.e., inflation-adjusted) dollars. Notwithstanding the price stability, pipeline customers now enjoy improved quality of service due to the increased service flexibility implemented under Order Nos. 636 and 637.



### OBSERVATIONS ABOUT THE FUTURE

Natural gas restructuring has been a success that has withstood the test of the past two decades. Natural gas commodity markets are workably competitive. Infrastructure has been expanded in response to market demands. Pipeline customers are receiving superior service at lower cost.

A critical challenge will be constructing the pipeline and storage infrastructure needed for accessing conventional and unconventional natural gas supply and delivering it efficiently to customers as the U.S. energy economy transitions to limit carbon emissions and reduce dependence on imported energy.

Maintaining and enhancing the competitive framework achieved during the initial stages of pipeline restructuring is the key to continued success. Even assuming willing and able infrastructure investors, there are major hurdles in obtaining the regulatory approvals to construct pipeline, storage and LNG

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facilities. While Congress generally has conferred on FERC the lead in obtaining the necessary certificate authority under the NGA, other federal statutes (e.g., the Coastal Zone Management Act, and Clean Water Act) and other federal and state agencies often have a significant role to play. Actions by other agencies can delay or stop a project. For example, a federal appellate court recently upheld a Connecticut environmental agency decision that denied Clean Water Act certification to a proposed pipeline from Connecticut to Long Island that both FERC and another state had approved. See *Islander East Pipeline Co. v. McCarthy*, 525 F.3d 141 (2nd Cir. 2008). In the wake of this decision, the project sponsors abandoned the project. In addition, proposals have been made to give more authority to state and regional authorities to determine the need and siting of new interstate pipelines. FERC's current policy, however, under which market forces determine in the first instance where new pipelines are needed through an "open season" auction procedure initiated by pipelines has worked well in providing timely and efficient infrastructure additions to link natural gas supply and consumer demand.



## 11.b

# HOW THE NATURAL GAS INDUSTRY WORKS TODAY

### OVERVIEW

Natural gas accounts for approximately one quarter of U.S. energy use. Ninety-eight percent of the natural gas consumed in the U.S. is produced in North America. Domestic natural gas production has increased in recent years, keeping prices relatively affordable. Natural gas is the cleanest burning fossil fuel, producing 45 percent less CO<sub>2</sub> than coal and 30 percent less CO<sub>2</sub> than fuel oil. This versatile fuel offers a means to achieve progress towards a cleaner energy economy and enhanced energy security during the decades it will take to commercialize and fully deploy new energy technologies.

Natural gas is used in a variety of applications that touch virtually every American consumer. It is used in the residential and commercial sectors for various heating and cooking purposes. Natural gas is used by industry as a fuel in boilers and process heat applications and as a chemical feedstock. Of growing importance, natural gas is used to generate electricity in central power plants and at distributed generation facilities at industrial, commercial, and some residential locations. Natural gas offers an excellent complement to renewable electric generating technologies, such as wind and solar, providing low-emissions backup for these intermittent sources of clean energy. The agriculture sector consumes natural gas for crop drying and is a major user of natural gas-based fertilizers. Natural gas also is used in the production of bio-fuels, such as ethanol.

The U.S. natural gas industry has three traditional segments and three emerging segments that are part of the value chain that delivers natural gas from the wellhead to the consumer. Production companies explore, develop and produce natural gas from underground natural gas and oil fields. Transportation companies operate the pipelines that link natural gas fields and processing plants to major consumer areas. Local gas distribution (LDC) utilities receive natural gas from transportation pipelines and deliver it to individual customers. Three emerging segments of the natural gas industry reflect the evolution that has occurred in the wake of the industry's restructuring. Gathering and processing, often referred to as the mid-stream segment of the natural gas value chain, has emerged as a distinct natural gas industry segment with companies focused on this business that are neither producers nor natural gas transportation pipelines. Another emerging segment of the industry in North America is the coastal terminals that receive and regasify liquefied natural gas (LNG) that is delivered from around the world by specially designed ocean-going ships. Finally, while they do not own and operate physical assets, the pipeline shippers that hold title to natural gas that is delivered to LDCs, power plants and other end-users could be seen as representing a distinct segment of the industry.

Natural gas in the U.S. is produced from approximately 450,000 natural gas wells (plus a like number of wells that produce natural gas in association with oil production). In addition to this domestic production, 14 percent of the natural gas consumed in the U.S. is imported from Canada and another two percent is imported from other countries in the form of LNG. Once it has been gathered and processed, natural gas is transported by 210 natural gas pipeline companies through a network of 302,000 miles of interstate and intrastate transportation pipelines. Transportation pipelines deliver natural gas to more than 1,300 gas distribution companies that maintain 1.2 million miles of distribution systems.

Middle man entities, primarily shippers, marketers and traders, arrange trades and sales in the natural gas commodity market. These so called “asset managers” arrange transportation from the producer to the end-user and are often affiliated with producers and pipelines. Traders participate in spot and derivative markets to hedge risks or profit on future price changes.

The U.S. natural gas industry also operates approximately 400 underground gas storage fields that consist of depleted oil and natural gas reservoirs, salt caverns, and aquifers. North American natural gas storage plays a key role in balancing supply and demand, particularly during peak-demand periods. Customers also may use storage to reduce pipeline demand charges, to hedge against natural gas price increases or to arbitrage temporal gas price differences. Pipelines and LDCs use storage for operational flexibility and reliability. Storage provides both an outlet for unconsumed natural gas supplies and an extra source of gas to meet unexpected demand. Storage at market trading hubs often provides balancing, parking, and loan services. (See Tab I.c for a full description of Natural Gas Storage.)

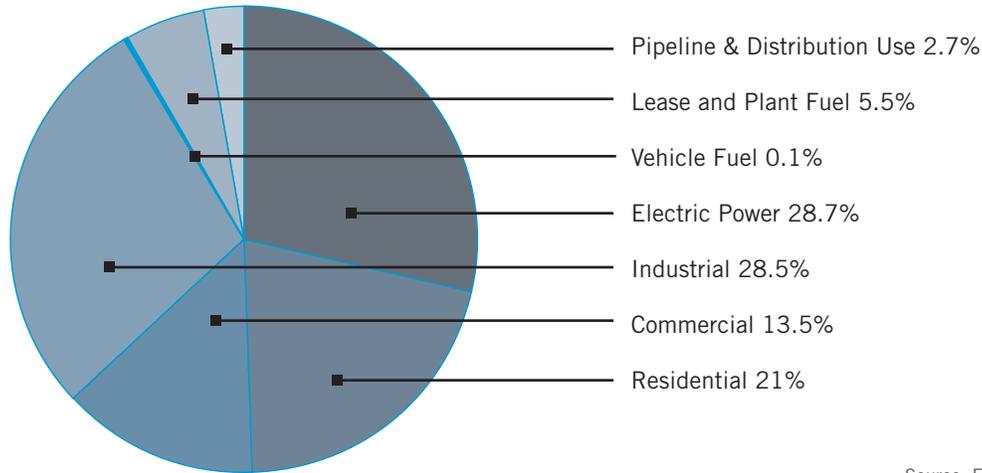
As of December 2008, there were seven operational LNG import/regasification facilities, one export facility and 100 peaking facilities in the U.S (plus two import facilities in Mexico) that provide additional supply sources for the natural gas market. These facilities have a rated sendout capacity of 10.735 Bcf per day. Several new LNG import terminals are under construction or planned in the U.S., Canada and Mexico. Currently there are an additional 28 facilities that have been approved with a combined capacity of 37.55 Bcf per day. The principal siting authorities in the U.S. are the Federal Energy Regulatory Commission (FERC) for onshore facilities and the U.S. Coast Guard for offshore terminals.

Today, the U.S. natural gas market is characterized by a dynamic commodity market with 29 trading hubs featuring balancing, parking, loan and storage services and multiple pipeline interconnects. Price discovery is provided by daily and monthly spot markets at these hubs and at other trading points and by a very robust New York Mercantile Exchange (NYMEX) futures market with contracts for delivery at the Henry Hub in Louisiana. Exchange-traded contracts and over-the-counter markets provide methods to hedge short-term and long-term natural gas price and regional basis risk. The U.S. market for natural gas transportation services also is dynamic in terms of scheduling and the pricing of interruptible services and secondary (capacity release) market transactions. Pipelines and storage operators offer sophisticated computerized information and transaction systems and flexible daily and intra-day scheduling that can adjust to changing customer demands caused by weather events and other market disruptions.



Today, the U.S. natural gas market is characterized by a dynamic commodity market with 29 trading hubs featuring balancing, parking, loan and storage services and multiple pipeline interconnects.

**Figure 6 US Natural Gas Consumption By End-Use, 2008**



Source: EIA

#### **TODAY'S INTERSTATE NATURAL GAS TRANSPORTATION MARKETPLACE**

As a result of natural gas wellhead decontrol enacted by the Congress and the subsequent restructuring of the natural gas industry by FERC, interstate pipelines are subject to far greater competitive risk today than when they provided bundled wholesale natural gas service. Today, pipelines face significantly greater market risk than do LDCs, the other segment of the natural gas industry that remains subject to public utility-type economic regulation. In most respects, the business risks facing interstate pipelines today are similar to those facing companies in unregulated parts of the economy.

FERC's restructuring initiatives transformed the industry, but not without costs. The restructuring caused significant turmoil for pipeline management and shareholders, and coincided with two pipeline companies declaring bankruptcy. Still, the end result has been a far more competitive and efficient interstate pipeline sector that makes it possible for consumers to realize the benefits of competitive natural gas commodity markets.

The Order No. 636 restructuring of pipeline services created incentives for interstate pipelines to act competitively and efficiently. Pipelines face multiple forms of competition which affect service offerings and prices, including competition with alternative fuels, competition between natural gas supply basins, competition among pipelines, and increased competition with firm shippers.

Since Order No. 636, most firm contracts have expired and been renegotiated and a significant number have rolled over. Long-term (15- and 20-year) firm service agreements largely have been replaced with

contracts of far shorter duration, sometimes as short as one to three years.<sup>2</sup> In a significant number of cases, customers have not renewed their firm service agreements. For instance, according to a 2005 INGAA survey of 29 interstate pipelines, customers turned back 45 percent of the capacity under contracts that expired in 2004.

This customer response is attributable in large part to the opportunities created by competitive pipeline service offerings. For example, utilizing these services, firm shippers can reshape their seasonal demand entitlements. This can be done by relinquishing capacity back to the pipeline and replacing it with storage

**Competitive pipeline alternatives are available to both “captive” customers served by a single pipeline and to “split connect” customers who have direct physical connections to two or more pipelines.**

or by purchasing capacity in the secondary market from other firm capacity holders. These competitive alternatives are available to both “captive” customers served by a single pipeline and to “split connect” customers who have direct physical connections with two or more pipelines.

Pipelines face even greater competition in the short-term market. In addition to competing with other pipelines (including intrastate and Hinshaw pipelines that are not subject to the same regulatory scrutiny as are FERC-regulated interstate pipelines) in both supply basins and the market area,

a pipeline competes with its own customers, who can offer their excess capacity in the secondary market. Often, pipelines must tailor their service offerings to account for price competition between natural gas supply basins as well as competition with alternate fuels, such as oil and coal.<sup>3</sup>

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2 This trend was recognized by the National Petroleum Council in its September 2003 report:

The key issue faced by the distribution and transmission industries is the recontracting of existing LDC contracts for firm pipeline capacity. During the next five years, 71% of all LDC firm capacity expires. As a result of the large amount of contract expirations, LDCs are viewed as unlikely to contract significant amounts of new firm transportation capacity, especially given the reluctance of some PUCs to allow them to enter into long-term contracts.

Another marked change within the industry relates to the expiration profile of firm transportation contracts. At year-end 2002, 77 BCF/D or 64% of the total firm transportation contracts were set to expire within the next five years. In 1998, the comparable amount was 51%. The 13% increase in expirations between the two five-year periods again indicates a continuing movement to shorter-term commitments.

National Petroleum Council, *Balancing Natural Gas Policy – Fueling the Demands of a Growing Economy*, Volume II Integrated Report, at 244 (2003).

The observations in the NPC report were confirmed by the results of a 2005 INGAA survey of 29 interstate pipelines. Less than 55% of the capacity under long-term contracts expiring in 2004 was renewed and, of that, the weighted average renewal term was 2.59 years. INGAA further estimates that 45% of long-term contracts will expire within the next three years.

3 According to a 2005 INGAA survey of 32 interstate pipelines, almost 71% of capacity held under short-term firm contracts (contracts of less than 365 days) was at a discounted rate. On average, customers receiving such discounts paid 37.45 cents on the dollar compared to the maximum cost-of-service tariff rate. In addition, over 48% of interruptible transportation was contracted at a discounted rate. On average, customers receiving such interruptible service discounts paid 46.40 cents on the dollar. In addition, on the surveyed pipelines, significant portions of the short-term firm and interruptible transportation subject to negotiated rates was provided at rates below the maximum cost of service rate (74.63% and 96.08%, respectively).

Given the competitive alternatives that customers enjoy, a pipeline's FERC-approved maximum tariff rate is not an entitlement to collect such a rate. Rather, a pipeline's pricing power is disciplined by what the market will bear. As a result, a significant portion of interstate pipeline throughput is being transported at rates that have been discounted from the FERC-approved maximum tariff rates or under agreements where the pipeline and its customer have negotiated an alternative rate design and rate level.<sup>4</sup>

Given the competitive alternatives that customers enjoy, a pipeline's FERC-approved maximum tariff rate is not an entitlement to collect such a rate. Rather, a pipeline's

In addition, Order No. 636 eliminated the three-year rate re-filing requirement which was part of the Purchased Gas Adjustment regulation. The absence of frequent rate cases adds to the other powerful incentives for controlling and reducing pipeline costs. These other factors include the shorter duration of customer contracts, price competition in pipeline capacity markets and shipper credit risk. These risks create incentives for pipeline efficiency and cost containment because there is no guarantee that pipeline costs will be recoverable in the marketplace. In contrast, the pre-restructuring public utility model for pipeline regulation did little to reward efficient operation. The changes in the business environment for interstate pipelines attributable to the competitive restructuring of the natural gas industry are summarized on page 33.

Pipeline competition has been stimulated by regulatory reforms that lowered the barriers to natural gas infrastructure development. FERC now satisfies its obligation to find that proposed pipelines meet the statutory "public convenience and necessity" standard generally by looking at evidence of shippers' contractual commitments for pipeline capacity instead of engaging in protracted, fact-intensive public hearings. FERC also has shortened greatly the average time required to obtain a certificate of public convenience and necessity by streamlining its procedures and encouraging early cooperation and participation with other federal and state agencies that have a role in authorizing pipeline construction. Promoting the development of a robust energy infrastructure is the first goal in FERC's current strategic plan and the agency remains focused on refining its regulatory program to remove barriers to constructing natural gas infrastructure.<sup>5</sup>

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4 According to a 2005 INGAA survey of 32 interstate pipelines, over 27% of capacity held under long-term firm contracts (contracts of 365 days or greater) was contracted at a discounted rate. On average, customers receiving such discounts are paying 52.76 cents on the dollar compared to the maximum cost-of-service tariff rate. In addition, more than 13% of long-term capacity on these pipelines is subject to negotiated rates. Over 83% of the negotiated rate volumes are contracted at rates below the maximum cost-of-service rate.

5 On June 15, 2006, FERC issued Order No. 678, a final rule intended to facilitate greater investment in natural gas storage facilities. In that order, FERC modified its market power analysis to reflect more accurately the competitive alternatives to natural gas storage and provided guidance on its interpretation of the criteria under the new section 4(f) of the Natural Gas Act, which authorized FERC in certain circumstances to authorize market-based rates for storage even if an applicant had not demonstrated that it lacked market power. On October 19, 2006 FERC issued a final rule that expanded the eligibility of blanket certificate activities for natural gas infrastructure projects. FERC's principal action was to increase the dollar limits on projects that are eligible for blanket processing from \$8.2 million to \$9.6 million for automatic authorizations and from \$22.7 million to \$27.4 million for projects that are subject to prior notice procedures. In addition, the final rule extends blanket eligibility to certain types of facilities that were previously excluded, including mainline, storage field facilities, and facilities transporting revaporized LNG.

Following several decades during which transportation pipeline capacity in the U.S. remained virtually constant,<sup>6</sup> interstate pipelines have added significant new capacity since Order No. 636.<sup>7</sup> Over the past 10 years, more than 20,000 miles of new natural gas transportation pipeline, representing more than 97 billion cubic feet per day of capacity, were placed in service in the U.S. While the pace of pipeline capacity additions slowed during the first half of this decade, several trends in the U.S. natural gas market have spurred investment in new transportation pipeline capacity to new levels. During 2007, 50 pipeline projects were completed that added 1,700 miles of new pipeline and 14.9 Bcf of daily deliverability, at a cost of \$4.3 billion. Approximately 200 pipeline projects are proposed between 2008 and 2010. If completed, these projects will add over 10,000 miles and 103 Bcf per day of capacity at an estimated total cost of close to \$28 billion.<sup>8</sup> Even with some attrition, which is to be expected,<sup>9</sup> the expansion of the interstate natural gas pipeline network during the final years of this decade is likely to dwarf the additions during the preceding 10 years.

A recent report released by the INGAA Foundation highlighted one of the trends that is creating the demand for significant new transportation pipeline capacity.<sup>10</sup> The pipeline infrastructure development boom is attributable largely to a remarkable resurgence of domestic natural gas production caused by the combination of new drilling technology and efficiencies, along with natural gas prices sufficient to support the investment in developing such supply. Domestic natural gas production had been in a decline for nearly 15 years before this trend was reversed beginning in 2005. Since then, domestic natural gas production has increased by over 1 trillion cubic feet per year. The principal reason for this resurgence of domestic natural gas production is the emergence of unconventional gas – coalbed methane, tight formation gas, and shale gas – as a major source of supply. There are multiple proposals to increase the capacity for transporting unconventional gas production from the Rocky Mountains and Mid-Continent to supply hubs.

### **BENEFITS FOR ALL INDUSTRY SEGMENTS – FOCUS ON THE CUSTOMER**

All classes of customers – traditional LDC shippers, direct end-use customers, electric generators, marketers and producers – have benefited greatly from the incentives created by the Order No. 636 restructuring.

For the last decade, pipeline rates generally have remained stable in nominal dollars and actually have gone down in real (i.e., inflation adjusted) dollars. For example, the rates charged in 2004 by an interstate pipeline, whose base rates last were set in 1996, were about 16 percent lower in real dollars compared to when FERC found such rates to be just and reasonable.<sup>11</sup> This benefit is attributable to the competitive culture fostered by Order No. 636.

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6 From 1971 to 1996, the total amount of transmission pipeline essentially remained constant (255,000 miles in 1971 compared to 259,000 miles in 1996). Credit Suisse First Boston, *The Natural Gas Primer*, October 2004, at 37.

7 During the 10-year span 1998-2008, the interstate pipeline industry will have added over 97 billion cubic feet per day of new pipeline capacity. *Major Changes in Natural Gas Transmission Capacity, 1998-2008*. Energy Information Administration, November, 2008.

8 *Additions to Capacity on the U.S. Natural Gas Pipeline Network: 2007*. Energy Information Administration, July, 2008.

9 Multiple proposed pipeline projects sometimes compete for the same market and typically not all projects are constructed.

10 The INGAA Foundation, Inc. “Availability, Economics, and Production Potential of North American Unconventional Natural Gas,” prepared by ICF International for The INGAA Foundation: Washington, DC, 2008.

11 Dallas Federal Reserve Bank website. U.S. GDP Price Deflator 1996Q1 to 2004Q4. [www.dallasfed.org](http://www.dallasfed.org)

In addition, the quality of interstate pipeline service has improved demonstrably due to the increased flexibility spurred by Order No. 637. Examples of such flexibility include hub services (wheeling receipts and deliveries between pipelines), park and loan services, supply pooling services and, in some cases, hourly intraday nominations. Segmentation has allowed shippers to partition a single route into multiple routes, thereby creating value through supplemental transportation paths and additional sources of revenue in the secondary market for pipeline capacity. This flexibility enhances competition in the pipeline capacity market and adds value by facilitating transactions and commercial risk mitigation for purchasers and sellers of natural gas. An added benefit is that these service quality enhancements have come largely at no increase in cost to pipeline customers.

Pipeline shippers, natural gas producers and natural gas consumers have benefited from the incentives for pipelines to develop new capacity linking natural gas supply and consuming markets. An example is the expansion of the Kern River Gas Transmission system that entered service in May 2003. The expansion relieved the capacity constraint that had depressed the price received by natural gas producers in Wyoming and resulted in a significant increase in competitive gas supply alternatives for consumers in California and Nevada.<sup>12</sup>

Interstate pipeline transportation and storage now represent by far the smallest piece of the industry's wellhead-to-burnertip value chain. According to the Energy Information Administration (EIA), interstate transportation and storage, on average, represented only nine percent of the delivered price of natural gas paid by residential consumers during the 2004-2005 winter heating season. In contrast, according to EIA, the natural gas commodity represented 59 percent of the delivered price of gas during the same period. (The remainder, 33 percent, is the cost of local distribution.) This conclusion is confirmed by a 2006 Government Accountability Office report showing that, as a portion of the total delivered price of natural gas, the cost attributable to interstate transportation declined from approximately 20 percent in 1993 to less than 10 percent in 2005. Importantly, according to GAO, over the same period the cost of interstate transportation also declined in real terms. See <http://www.gao.gov/new.items/d06968.pdf>.

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12 Energy Information Administration, U.S. Natural Gas Pipeline and Underground Storage Expansions in 2003, at 7.

## CONCLUSION

The Order Nos. 636-637 restructuring process is a success that has withstood the test of time. Natural gas commodity markets are workably competitive. Infrastructure has been expanded in response to market demands. Pipeline customers are receiving superior service at no greater cost than they paid prior to restructuring (and, in real terms, at less cost).

The competitive forces unleashed by restructuring along with the opportunity for interstate pipeline shareholders to retain the benefits resulting from efficiency gains have created a win/win situation for the industry and for consumers. Pipelines have succeeded in expanding infrastructure, because capital markets are comfortable with the balance between regulation, competition and the ability to achieve commensurate financial performance. Natural gas markets, and all categories of natural gas consumers, have benefited because new infrastructure creates access to natural gas supply and relieves capacity bottlenecks both upstream in supply basins and downstream in consuming markets.

One of the greatest energy challenges facing the U.S. today is the transition to a clean energy economy. Natural gas offers a means to achieve progress towards a cleaner energy economy during the decades that it will take to commercialize and deploy new energy technologies. Pipeline and storage infrastructure represents an indispensable link in achieving this result. Maintaining the balance achieved in natural gas regulation during pipeline restructuring will be a key to continued success.

Wholesale natural gas markets in the U.S. represent one of the true success stories of economic deregulation and industry restructuring. Any changes in the fundamental framework of post-Order No. 636 natural gas pipeline regulation should be undertaken with great care, especially with regard to aspects of the regulatory regime that directly affect the attractiveness of natural gas infrastructure investment.<sup>13</sup>

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13 In its 2003 report, the National Petroleum Council stated:

Regulators must recognize that aging infrastructure will need to be continuously maintained and upgraded to meet increasing throughput demand over the study period. They must also recognize that large investments will be required for the construction of new infrastructure. To make the kinds of investments that will be required, operators and customers need a stable investment climate and distinguishable risk/reward opportunities. Changes to underlying regulatory policy, after long-term investments are made, increase regulatory and investment risk for both the investor and customers.

National Petroleum Council, *Balancing Natural Gas Policy – Fueling the Demands of a Growing Economy*, Volume 1 Summary of Findings and Recommendations, at 65 (2003).

**HOW THE INDUSTRY WORKS TODAY**

	<b>Before Regulatory Changes</b>	<b>Today</b>	<b>Impact On the Pipelines</b>
<b>Customers</b>	principally LDCs	LDCs, marketers, producers, industrial users and electric power plants	pipelines must provide more flexible and responsive service options in this more complex business environment
<b>Services Offered</b>	bundled gas sold only to LDCs with pipeline responsible for gas purchasing and storage.	pipelines are open-access contract carriers, no longer allowed to provide bundled sales, transportation and sales services	introduced pipe-on-pipe competition; new services such as STFT, PALS, etc. added to meet needs of new customer base.
<b>Pipeline Capacity Owner</b>	pipelines	LDCs, marketers, producers, Industrial users, elec. power plants	pipelines now compete with “released capacity” from their own transportation customers
<b>Storage Capacity Owner</b>	pipelines	LDCs, marketers, and independent storage operators	pipelines compete with new entrants
<b>Length of Contracts</b>	25-30 years	2-5 years	new projects undertaken at greater financial risk without long-term guaranteed revenue stream
<b>Nomination &amp; Scheduling</b>	daily nominations only directly with LDC	hourly nominations and scheduling verifications with wider customer base of LDCs, marketers, etc.	more complex operations





# CHALLENGES FACING THE INTERSTATE NATURAL GAS PIPELINE INDUSTRY

## HISTORIC MARKET OVERVIEW

Interstate natural gas sales were subject to federal regulation, beginning with the Natural Gas Act in 1938 and increasing with wellhead price regulation that started in 1954. Throughout much of the 1970s, federal regulation caused shortages of natural gas in the interstate markets because wellhead prices were kept artificially low. In response, Congress passed the Natural Gas Policy Act of 1978 (NGPA), which raised prices for all natural gas dedicated to interstate markets and immediately deregulated some categories of new production. The maximum price of other (non-deregulated) new natural gas was set according to complex categories that had various initial prices, escalation rates and dates of decontrol. By 1985, most natural gas dedicated to interstate markets had been deregulated under NGPA, and by 1990 essentially all natural gas was free of price controls due to the Natural Gas Wellhead Decontrol Act of 1989.

Beginning in the mid-1980s, the U.S. natural gas market experienced a protracted period of oversupply that lasted until the late 1990s. The “natural gas bubble” resulted from a confluence of factors that included the stimulus to natural gas production resulting from higher NGPA ceiling prices, federal laws enacted in connection with the NGPA that discouraged natural gas consumption in particular applications, and an economic recession in the early 1980s that reduced natural gas demand.

The gas bubble had been worked off by the late 1990s, as deliverability declined in traditional natural gas fields that were connected with available pipeline capacity. Even with significant new supplies coming from Canada, the Rockies and reopened LNG terminals, the U.S. entered a period during which the natural gas system operated nearly year-round with little excess wellhead deliverability. This situation of tight wellhead deliverability, combined with high world oil prices and disruptive weather events such as the 2005 hurricanes, resulted in relatively high natural gas prices and greater price volatility.

More recently, the combination of new drilling technology and efficiencies along with natural gas prices sufficient to support investment in developing gas supply has led to a resurgence of domestic natural gas production. Wellhead natural gas prices have moderated due to the significant volumes of new gas production brought to market within a short period and the effect of slowing economic activity.

As a parallel to wellhead decontrol, the Federal Energy Regulation Commission (FERC) undertook a fundamental change to pipeline regulation beginning in the mid-1980s and culminating in the early 1990s. The interstate pipelines, which prior to 1994 purchased natural gas for resale to LDCs, now provide only transportation and storage service.

Retail restructuring at the state level also has had an impact on the natural gas industry, giving customers the opportunity to purchase natural gas from someone other than their LDC. This trend toward greater customer choice gathered strength slowly. First, LDCs increased customer service options to large industrial and power customers. These options have become increasingly available to commercial and residential customers. Most customers, however, have chosen to stay with the local utility to purchase natural gas supply.

The U.S. natural gas market is today characterized by a dynamic commodity market with several regional trading hubs that feature balancing, parking, loan and storage services and multiple pipeline interconnects. Price discovery is provided by daily and monthly spot markets at these hubs and other trading points and by a very robust futures market operated by the New York Mercantile Exchange (NYMEX). The delivery point for the NYMEX natural gas futures contract is the Henry Hub in Louisiana. Exchange-traded contracts and over-the-counter markets provide methods to hedge short-term and long-term natural price and regional basis risk. The U.S. market for natural gas transportation services is also dynamic in terms of scheduling and the pricing of interruptible services and secondary (capacity release) market transactions. Pipelines and storage operators offer sophisticated computerized information and transaction systems and flexible daily and intra-day scheduling that can adjust to changing customer demands caused by weather events and other market disruptions.

### **TRENDS IN NATURAL GAS SUPPLY CONTRACTING AND MANAGEMENT**

The federal and state rulemakings that occurred in the 1990s transferred contracting and management responsibility from a few pipelines that had aggregated demand to a large number of individual LDCs and large natural gas consumers balancing smaller gas volumes. The current market and regulatory environment provides disincentives to long-term transportation and commodity contracts for all of the major classes of natural gas customers.

LDCs often have been discouraged by state regulators from contracting for additional natural gas transportation capacity or entering into long-term, fixed price supply contracts. In some cases, risk management through portfolio diversification and hedging programs is not well understood by regulators. In addition, regulators often are reluctant, or in some instances are unable within existing statutory authority, to “pre-approve” long-term commitments that may, at times, require an LDC to pay more than the prevailing spot market price.

Independent and utility power generators in many regional power markets have decided that living with the volatility of a short-term natural gas market makes economic sense given the regulatory and market structure of the electricity industry. Without properly structured capacity payments, a generator assumes cost recovery risk whenever it enters into a long-term contract that creates a financial obligation that is not avoidable when the generator is not being dispatched. Contracts for fixed volumes of natural gas or pipeline/storage capacity can create such obligations. In contrast, a decision to purchase natural gas at prevailing market prices – whatever the cost – can present significantly less risk of under-recovery. If natural gas supplies are unavailable, the power plant can simply shut down.

Industrial customers always have had incentives to minimize their contractual commitments while implementing their natural gas purchasing risk management strategies. Industrial customers with alternative fuel capability, in particular, are reluctant to enter into long-term contracts. Such contracts can create fixed costs and liabilities on the balance sheet that reduce the option value created by the dual-fuel capability.

The “free-rider” problem also creates disincentives for all classes of shippers that are considering contracts for natural gas pipeline capacity, because shippers often can use released capacity or interruptible transportation obtained at a discount to get many of the benefits of increased capacity after it has been built. If a shipper can come on as a “free-rider” and avoid the need to make firm capacity payments, there is little incentive to sign contractual commitments for projects. The “free-rider” problem allows shippers to delay as long as possible any contractual commitment to a new project because of uncertainty regarding future prices and the hope that the project will be built without their commitment. This is particularly true for unregulated shippers that do not have a regulated obligation to serve, but also affects the contracting

practices of natural gas distribution companies that must worry about the competitiveness of their systems' gas supply portfolio compared to unregulated marketers. This fundamental problem has yet to be addressed in any meaningful way.

In 2005, the National Association of Regulatory Utility Commissioners (NARUC) adopted a resolution recognizing the importance of long-term contracts in the development of natural gas infrastructure. The North American natural gas industry's ability to meet growing demand over the next 15 years will depend on whether large, expensive gas pipeline and storage projects are built and whether balanced land access policies and a favorable investment climate support domestic natural gas production. Investors in these production and infrastructure projects will recover the costs (including the return) over many years. The absence of long-term contracts to underpin such projects creates a risk that the investment may be delayed, diverted to other countries or abandoned.<sup>14</sup> These contracts are essential to providing reliable and affordable natural gas to consumers.

### **CONTRACTS ALLOCATE OBLIGATIONS AND RISKS**

Contracts are the means by which parties associated with an investment (equity holders, debt holders, insurers, suppliers, buyers, etc.) can assign rights and obligations and allocate risks. Equity holders and lenders will evaluate each source of risk and methods of mitigating those risks before committing money. Any source of risk to a project that is not mitigated may reduce the credit rating of a project or its equity holders, may increase costs of borrowing, or may lead to project delay or abandonment.

Long-term sales contracts are one way of reducing risks to developers and lenders for large-scale, energy-supply projects. Long-term sales contracts are important because they increase the assurance that the investment will receive revenue. The long-term sales contract can mitigate "volume risk" by assuring that a minimum amount of sales or throughput occurs. The long-term sales contract also can mitigate "price risk" by setting a fixed price or by specifying a pricing formula based on a well understood – and possibly hedgeable – price index.

Long-term sales contracts can reduce volume and price risks for nearly any type of investment. Generally speaking, long-term sales contracts tend to be most important and most common in financing industries and projects for which the market is limited by geography or by the specialized nature of the product and where capital costs are a large part of total production costs. Wise investors will not put themselves in the position of negotiating sales having already sunk large capital costs in a market with limited buyers. Because of the high capital cost of pipeline projects and a regulatory structure that limits the return on investment, natural gas pipeline projects are not built on speculation. Long-term contracts for firm transportation service are required. Long-term sales contracts may also be common in situations where an unusual degree of coordination is needed between the provider and the buyer or where transaction costs from frequent short-term contracting are high. On the other hand, long-term sales are relatively less important when an investment has relatively low capital costs and produces a product or service that has a broad, liquid market with easy price discovery and low transaction costs. It is worth noting that in today's market, long-term contracts typically are for terms of 10 years or shorter on pipelines whose depreciable lives can exceed 25 years. Thus, long-term contracts of such duration cannot insulate a project sponsor from bearing long-term risks.

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14 In 2004, the INGAA Foundation, Inc. completed a study entitled "An Updated Assessment of Pipeline and Storage Infrastructure for the North American Gas Market: Adverse Consequences of Delays in the Construction of Natural Gas Infrastructure" that projected that a two-year delay in infrastructure construction – estimated by need at the time of the study – would cost consumers in excess of \$200 billion by 2020.

## NATURAL GAS PIPELINE CONTRACTS AND FINANCING

Natural gas pipelines are good examples of investments that normally require long-term service contracts before developers and lenders are willing to risk money. Natural gas pipeline service has only a very limited geographic market (moving natural gas between point A to point B) and a high capital cost component. U.S. natural gas pipelines must adhere to a government mandated open access policy that prohibits withholding unused capacity from the market if a shipper/customer is willing to contract for that capacity at the maximum cost-based rate. Pipelines also are subject to a type of rate regulation that prevents them from capturing the upside of the market because the marketplace requires them to discount when there is excess transportation capacity and limits them to cost recovery when excess demand exists.

## ISSUES RELATED TO NATURAL GAS PIPELINE CONSTRUCTION

One other factor that is complicating pipeline investments is the required time from inception to completion of a project. Various factors from the “Not In My Back Yard” syndrome to broadened environmental concerns have extended the period to plan, design and construct a pipeline. Several high profile pipeline projects in areas of constrained pipeline capacity have experienced significant delays. These delays extend the volatile and high pricing caused by insufficient pipeline capacity. This raises the concern that the present market signals for shippers, regulators, and pipelines to expand capacity may not anticipate needs as far in advance as necessary to prevent market disruption. It is important to note that all three of the participants (shippers, regulators and pipelines) must be committed for a pipeline project to move forward. Unfortunately, the time between market recognition (basis differential criteria reached) and pipeline in-service date has been increasing for many pipeline projects, making it more critical that long-term shippers commit as quickly as possible in order to minimize the consumer impact from high and volatile natural gas prices.

## INFRASTRUCTURE INVESTMENT NEEDS

Expansion of natural gas supply in North America will require large-scale outlays of capital for all components of natural gas infrastructure. It will also require access to properties for pipelines, storage facilities and LNG terminals and timely approval from regulatory agencies. Investment and the contractual support necessary to underpin the infrastructure development will be required in the following components of industry infrastructure:

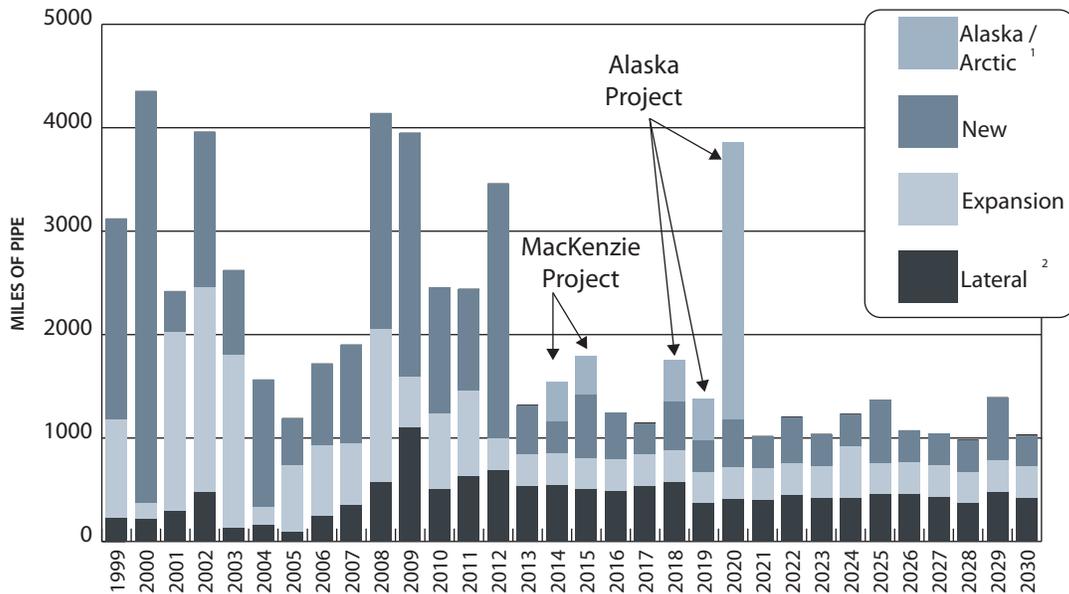
- ▶ New natural gas transportation pipelines
- ▶ Testing and maintenance of existing natural gas pipelines
- ▶ New and expanded natural gas storage facilities
- ▶ Enhanced and expanded natural gas distribution systems
- ▶ U.S. natural gas production and gathering facilities
- ▶ Foreign natural gas production, liquefaction facilities and ships to support U.S. LNG imports
- ▶ Potential LNG regasification facilities and associated storage facilities

According to a study prepared for the INGAA Foundation, significant pipeline infrastructure from \$160 to \$210 billion will be needed for construction of new natural gas pipelines to connect new supply sources and customers over the next 20 years.<sup>15</sup> Figure 7 shows the annual projected North American Pipeline additions including the McKenzie and Alaska projects through 2030. These additions average about 1,200 to 1,300 miles per year and will require transportation contracts to underpin construction and allocate the risk of cost recovery.

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15 INGAA Foundation Inc., “Natural Gas Pipeline and Storage Infrastructure Projections Through 2030,” prepared by ICF International, August 2009.

**Figure 7 Projected North American Pipeline Additions Base Case (Miles)**



- 1 Includes pipeline mileage of downstream expansions on existing corridors in the U.S. and Canada in addition to the pipeline associated with the arctic Canada and Alaska frontier projects.
- 2 Lateral is defined as a spur off the main transmission line, normally used to connect production, storage, power plants, LNG terminals or isolated demand centers.

Source: ICF International

After declining in 2009 and 2010 due to the economic conditions, the cost of constructing new natural gas pipelines is projected to increase by approximately 50 percent between 2011 and 2030. Investment will also be needed for testing, refurbishing and replacing existing pipeline to maintain current throughput capacities. Pipeline integrity inspection regulations will require that additional investments be made in equipment such as smart pig launchers and receivers on the existing pipeline network. The capital and testing costs will be roughly \$350 million per year through 2012. Testing costs will be approximately \$100 million per year thereafter. Also, existing pipeline facilities will need to be upgraded as denser development encroaches on existing pipeline rights of way.

### POTENTIAL COSTS FROM DELAYS IN NATURAL GAS INFRASTRUCTURE

Since 1999, natural gas prices have increased and become more volatile. The potential magnitude of these effects first became evident in early 2000. In the winter heating seasons of 2000-01 and 2002-03, gas prices “spiked” to levels that had previously seemed unimaginable.<sup>16</sup> The increase in prices and in price volatility occurred because there was no unutilized capacity to deliver additional supplies of gas to the market when weather, economic activity and increased power generation increased natural gas demand. The supply/demand imbalances became too large to be moderated by the behavior of customers who could easily respond to changing price conditions. As a result, large and rapid increases in delivered natural gas prices occurred. A similar set of factors caused the spike in natural gas prices that started during the 2005 hurricane season.

<sup>16</sup> The 2001-02 heating season did not experience a natural gas price spike because of unusually warm weather that reduced gas demand for space heating.

Once production and storage approach their physical deliverability limits, price increases do not result in an immediate increase in the quantity of natural gas that can be delivered to consumers. New sources of natural gas, from North American onshore sources of conventional and unconventional gas, offshore supply sources and LNG imports, must be developed (along with storage capacity) to match the market's load profile. Similarly, as pipeline transportation capacity limits are reached, increases in the market value of pipeline transportation – the basis – will not result in an immediate increase in the amount of natural gas that can be delivered. The lead-time associated with new pipeline capacity does not allow for an instantaneous supply response when all of the capacity is being utilized. Once capacity is reached, available supply changes very little, regardless of price.

Natural gas projects (production, LNG, pipeline or storage) inherently involve large capital investments. In addition, many environmental, land use, and other permits must be obtained before construction can begin. While FERC and other permitting agencies have made commendable efforts to accelerate these processes, these requirements still can be many months, and for large projects, the period can stretch to multiple years.

As a result of these market fundamentals, any additional delays in constructing natural gas infrastructure caused by the lack of long-term contracts, delays in obtaining required permits and other

obstacles can be costly to natural gas consumers and harmful to the stability of North American energy markets. An analysis conducted in 2005 for the INGAA Foundation (see footnote 3) found the move away from long-term contracts has increased the risks of infrastructure investment, and these added risks could indeed influence whether, and when, investments are made. The paper also showed there are large potential adverse economic consequences of infrastructure delays in terms of higher natural gas prices and greater price volatility. The direct costs to gas consumers of delays of 12 to 36 months in natural gas infrastructure construction would range from \$179 to \$653 billion over the next 15 years. There would also be additional costs born by consumers through higher electricity prices and lost jobs as energy-intensive industries adjusted to higher energy prices. In addition, the volatility of gas and electricity prices would increase if natural gas infrastructure is delayed, causing further economic loss through slower and less efficient investment decisions by energy producers and consumers.

Given these factors, encouraging more long-term contracting by all classes of shippers should be considered as an element in federal and state policies to ensure adequate investment to maintain current capacity as well as adequate investment to expand natural gas infrastructure to meet market demand. Also, measures to encourage portfolios with long-term contracts should address the regulatory and market risks for cost recovery.



There are large potential adverse economic consequences of infrastructure delays in terms of higher natural gas prices and greater price volatility.



### III. The Legal and Regulatory Framework for Interstate Natural Gas Pipelines



The Interstate Natural Gas Association of America



### III. The Legal and Regulatory Framework for Interstate Natural Gas Pipelines

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## III.a

# MAJOR FERC RULES, ORDERS AND POLICY STATEMENTS

### **ORDER NO. 712 (CAPACITY RELEASE RULE)**

In June 2008, FERC issued rules liberalizing its approach to transactions in the so-called secondary market where pipeline customers may release for resale capacity they have contracted for directly with the pipeline. (The pipeline sale of capacity in the first instance is the “primary market.”) FERC’s new rule permits market-based pricing for short-term releases (a year or less) of pipeline capacity. The Commission denied a request by INGAA and individual interstate pipelines to extend the same pricing freedom to short-term pipeline services in the primary market that compete with released capacity. As a result, those pipelines services remain subject to a cost-based maximum recourse rate. The Commission also liberalized its capacity release regulations to facilitate transactions by “asset managers” that package the capacity that is made available through releases from customers with sales of natural gas.

### **ORDER NO. 710 (PIPELINE REPORTING (FORMS 2, 2-A AND 3-Q))**

In March 2008, FERC adopted substantial new reporting requirements for interstate pipelines. FERC’s new rules require pipelines to report, in addition to existing detailed financial and operating information:

- 1) the disposition of shipper-supplied natural gas;
- 2) transactions between the pipeline and its affiliates;
- 3) revenues and volumes applicable to discounted and negotiated rate services; and
- 4) identification of rate treatment afforded new pipeline projects.

In addition, FERC’s new rules require more detail regarding tax expenses, distribution of salaries and wages, and employee pensions and benefits.

### **ORDER NO. 678 (MARKET-BASED STORAGE)**

The Commission, in 2006, adopted new regulations that reformed its approach to authorizing market-based pricing of storage service. In the context of regulations that already permitted market-based pricing premised on an absence of market power, the Commission liberalized its market-power analysis (in accordance with modern economic and antitrust analysis) to permit consideration of close substitutes to natural gas storage in defining the relevant product market. This reform will help protect against applying an overly narrow definition of the relevant market. The Commission also adopted new regulations to implement section 312 of the Energy Policy Act of 2005, which permits the Commission to authorize market-based storage rates for new storage capacity – even when the storage providers do not demonstrate a lack of market power – in circumstances where the applicant can nevertheless show that consumers will be protected from market power abuse. Congressional and Commission goals behind these regulations are to reduce natural gas price volatility and improve adequacy of natural gas supply during periods of peak demand by encouraging expansions of storage capacity. In adopting these regulations, the Commission resisted proposals to foreclose out of hand applications for market-based rate authority by storage providers that are affiliated with pipelines.

### **PLO4-3 (POLICY STATEMENT ON NATURAL GAS QUALITY AND INTERCHANGEABILITY)**

The Commission, in 2006, rejected calls to establish hard and fast natural gas quality and interchangeability rules or specifications to address issues that surfaced in relation to LNG imports and economic conditions that affected the degree to which natural gas was processed before it reaches interstate pipelines. Instead, the Commission announced a policy that consisted of five principles: (1) only the quality and interchangeability specifications in FERC-approved natural gas tariffs can be enforced; (2) pipeline tariff provisions need to be flexible to accommodate the evolving nature of the science, and to permit pipelines to balance safety and reliability concerns, on the one hand, with maximizing natural gas supply, on the other; (3) pipelines and their customers should develop specifications based on technical requirements; (4) pipelines and their customers should negotiate such technical solutions based on guidelines developed by a multi-segment industry group (so-called “NGC+” guidelines); and (5) FERC will consider natural gas quality disputes on a case-by-case basis. (See <http://www.ingaa.org/cms/28/8666.aspx> for more information.)

### **ORDER NOS. 717, 2004 AND 497 (PIPELINE/AFFILIATES “STANDARDS OF CONDUCT”)**

The Commission first adopted “standards of conduct” to regulate natural gas pipelines’ interactions with their marketing affiliates (i.e., affiliates that purchase gas at the wellhead, and then transport and distribute it to buyers) in 1988 in Order No. 497. The standards imposed extensive reporting requirements as well as certain “Chinese Wall” restrictions, which required pipelines and those affiliates to function independently, and restricted the sharing of information between pipelines and their marketing affiliates. Those Order No. 497 regulations were based on the theoretical threat that pipelines would impede competition by favoring their own marketing affiliates and complaints by other sellers who were competing with such affiliates. In Order No. 2004, the Commission extended those standards to govern pipeline relationships with other affiliated entities such as producers, gatherers, processors, and to some extent affiliated local distribution companies that were previously exempt from the affiliate rules. The extension of the standards of conduct adopted in Order No. 2004 was vacated by a court of appeals decision in 2006. *National Fuel Gas Corp. v. FERC*, 468 F.3d 831 (D.C. Cir. 2006). In 2008, the Commission issued Order No. 717, which generally returned “to the core principles” of its original Order No. 497 to focus on areas with the greatest potential for abuse. The rules apply only to pipelines with a marketing affiliate that is a shipper on the pipeline. The Commission modified its core requirement that employees of the pipeline function independently of marketing function employees in a number of respects that provide greater flexibility. For example, the independent functioning restriction applies only to pipeline employees that are involved in day-to-day natural gas transportation operations. Similarly, covered marketing function employees are limited to those who actively and personally engage in marketing functions on a day-to-day basis. The general “no conduit rule” bars a pipeline (or its employees, contractors, etc.) from using anyone as a conduit to disclose non-public information about pipeline transportation, and various posting/publication requirements are designed to alert the public to potential preferences.

### **ORDER NO. 637 (PIPELINE TRANSPORTATION REGULATIONS)**

The Commission, in 1999, amended its regulations governing the provision of unbundled pipeline transportation service (see discussion of Order Nos. 636 and 436 on next page) in response to the growing development of more competitive markets for natural gas and its transportation. As an experiment, the rule waived, for a two-year period, cost-based price ceilings for short-term releases of capacity by shippers with long-term rights to the capacity. (As discussed earlier in the section, Order No. 712 has now adopted that reform on a permanent basis.) The Commission encouraged pipelines to file for peak/off-peak and term-differentiated rate structures. It also mandated significant new shipper transportation rights in terms of scheduling procedures, primary and secondary point rights, and the ability to segment shipper capacity paths. In order to remove economic biases in the existing regulations, Order No. 637 narrowed a shipper’s “right of first refusal” to re-subscribe to long-term capacity.

### **ORDER NO. 636 (THE RESTRUCTURING RULE—MANDATORY UNBUNDLING)**

In 1992, FERC required interstate pipelines to unbundle, or separate, their sales and transportation services and to provide open-access transportation services equal in quality regardless whether its customer purchased the natural gas directly from the pipeline company or from a producer, marketer, or elsewhere. The order includes provisions that (1) encourage use of market centers where several pipeline systems interconnect and buyers and sellers can make or take natural gas deliveries; (2) established a “released capacity” market for transportation and storage capacity under which shippers are permitted to release their unneeded firm capacity to a replacement shipper who may re-release that capacity if permitted by the terms of the initial release; and (3) imposed a new rate design (“straight-fixed-variable”) that was intended to promote competition among natural gas suppliers by eliminating price distortions inherent in the pre-existing rate design that allocated certain fixed costs such as return on equity and related taxes to a commodity (usage) charge. This charge was levied on a per unit basis and applied to the volume of natural gas actually used, thus affecting costs for firm and interruptible customers alike.

### **ORDER NO. 436 (“OPEN ACCESS” PIPELINE TRANSPORTATION)**

Described as “one of the three great regulatory milestones of the industry” by the reviewing court, Order No. 436, issued in 1985, initiated the restructuring of interstate pipelines from merchant sellers and transporters of natural gas into transportation only businesses. The principal feature of the regulations was a regulatory “bargain” under which pipelines that committed to provide “open access” transportation service – i.e., service that would not favor transportation of natural gas sold by the pipeline, and which would be offered on a “first-come, first-served” basis when capacity was fully committed - could take advantage of “blanket certification” of new transportation. That is, new transportation services would be authorized generically, eliminating the need for long and costly individual certification proceedings. Other principal features of the order included (1) the freedom to adjust rates within a maximum-minimum range, including the ability to offer discounts to customers on a non-discriminatory basis; (2) a requirement that participating pipelines allow their LDC customers to convert existing “contract demand” for bundled natural gas and transportation service into an obligation to take the pipeline’s transportation services only; and (3) issuance of “Optional, Expedited Certificates” for new facilities, services and operations where the pipeline undertakes the entire economic risk of the project. While the reviewing court upheld most of the fundamental features of Order No. 436, the court sent it back to the Commission to address the question of how pipelines could meet their increasing “take-or-pay” obligations to producers if their customers were to be relieved of their obligation to pay the pipelines for the natural gas.

One of the three great regulatory milestones in the industry, Order No. 436 allowed for the elimination of long and costly individual certification proceedings.

More comprehensive lists and descriptions of FERC natural gas orders are available at: (1) [http://www.eia.doe.gov/oil\\_gas/natural\\_gas/analysis\\_publications/ngmajorleg/ngmajorleg.html](http://www.eia.doe.gov/oil_gas/natural_gas/analysis_publications/ngmajorleg/ngmajorleg.html) and (2) <http://www.ferc.gov/legal/maj-ord-reg.asp>.

Docket No.	Date	Title
Order No. 712-A (RM08-1-001)	Order No. 712-A (RM08-1-001)	Promotion of a More Efficient Capacity Release Market (Order on Rehearing)
RM09-2-000	November 20, 2008	Contract Reporting Requirements of Intrastate Natural Gas Companies (Notice of Inquiry)
Order No. 720 (RM08-2-000)	November 20, 2008	Pipeline Posting Requirements under Section 23 under Natural Gas Act (Final Rule)
RM96-1-029	September 18, 2008	Standards for Business Practices of Interstate Natural Gas Pipelines (NOPR)
Order No. 704-A (RM07-10-001)	September 18, 2008	Transparency Provisions of Section 23 of the Natural Gas Act (Order on Rehearing and Clarification)
Order No. 710-A (RM07-9-001)	June 20, 2008	Revisions to Forms, Statements, and Reporting Requirements for Natural Gas Pipelines (Order on Rehearing)
Order No. 712 (RM08-1-000)	June 19, 2008	Promotion of a More Efficient Capacity Release Market (Final Rule)
Order No. 710 (RM07-9-000)	March 21, 2008	Revisions to Forms, Statements, and Reporting Requirements for Natural Gas Pipelines (Final Rule)
Order No. 686-C (RM06-7-003)	January 17, 2008	Revisions to the Blanket Certificate Regulations and Clarification Regarding Rates (Order Denying Rehearing)
RM08-2-000	December 21, 2007	Pipeline Posting Requirements under Section 23 under Natural Gas Act (NOPR)
RM08-1-000	November 15, 2007	Promotion of a More Efficient Capacity Release Market (NOPR)
Order No. 700 (RM07-17-000)	October 18, 2007	Revisions to Landowner Notification and Blanket Certificate Regulations (Final Rule)
RM07-9-000	September 20, 2007	Revisions to Forms, Statements, and Reporting Requirements for Natural Gas Pipelines (NOPR)
Order No. 686-B (RM06-7-002)	September 20, 2007	Revisions to the Blanket Certificate Regulations and Clarification Regarding Rates (Order on Rehearing)
Order No. 698 (RM96-1-027)	June 25, 2007	Standards for Business Practices for Interstate Natural Gas Pipelines; Standards for Business Practices for Public Utilities (Final Rule)
Order No. 686-A (RM06-7-001)	June 22, 2007	Revisions to the Blanket Certificate Regulations and Clarification Regarding Rates (Order on Rehearing)
RM07-17	June 22, 2007	Revisions to Landowner Notification and Blanket Certificate Regulations (NOPR)
RM07-10-000	April 19, 2007	Transparency Provisions of section 23 of the Natural Gas Act; Transparency Provisions of the Energy Policy Act (NOPR)

Docket No.	Date	Title
RM07-1-000	January 18, 2007	Standards of Conduct for Transmission Providers (NOPR)
Order No. 678-A (RM05-23-001 and AD04-11-001)	November 16, 2006	Rate Regulation of Certain Natural Gas Storage Facilities (Order on Clarification and Rehearing)
RM96-1-027 and RM05-5-001	October 25, 2006	Standards for Business Practices for Interstate Natural Gas Pipelines and Public Utilities (NOPR)
Order No. 687 (RM06-1-000)	October 19, 2006	Regulations Implementing the Energy Policy Act of 2005; Coordinating the Processing of Federal Authorizations for Applications under Sections 3 and 7 of the Natural Gas Act and Maintaining a Complete Consolidated Record (Final Rule)
Order No. 682 (RM06-18-000)	October 19, 2006	Revisions to the Blanket Certificate Regulations and Clarification Regarding Rates (Final Rule)
Order No. 682 (RM06-18-000)	August 23, 2006	Revision of Regulations to Require Reporting of Damage to Natural Gas Pipeline Facilities (Final Rule)
<a href="#">Order No. 678</a> (RM05-23-000 & AD04-11-000)	June 19, 2006	Rate Regulation of Certain Natural Gas Storage Facilities (Final Rule)
<a href="#">RM06-7-000</a>	June 16, 2006	Revisions to the Blanket Certificate Regulations and Clarification Regarding Rates (NOPR)
<a href="#">PLO4-3-000</a>	June 15, 2006	Policy statement on provisions governing natural gas quality and interchangeability in interstate natural gas pipeline company tariffs
<a href="#">RM06-1-000</a>	May 18, 2006	Regulations Implementing the Energy Policy Act of 2005: Coordinating the Processing of Federal Authorizations for Applications under Sections 3 and 7 of the Natural Gas Act and Maintaining a Complete Consolidated Record (NOPR)
<a href="#">RM06-14-000</a>	February 16, 2006	Revisions to Record Retention Requirements for Unbundled Sale Service, Person Holding Blanket Marketing Certificates, and Public Utility Market-Based Rate Authorization Holders
<a href="#">Order No. 674</a> (RM06-13-000)	February 16, 2006	Conditions for Public Utility Market-Based Rate Authorization Holders (Final Rule)
<a href="#">Order No. 673</a> (RM06-5-000)	February 16, 2006	Amendments to Codes of Conduct for Unbundled Sales Service and for Persons Holding Blanket Marketing Certificates (Final Rule)
<a href="#">RM05-23-000 and AD04-11-000 (NOPR)</a>	December 22, 2005	Rate Regulation of Certain Underground Storage Facilities

Docket No.	Date	Title
<a href="#">PL03-3-006 and AD03-7-006</a>	July 6, 2005	Order Further Clarifying Policy Statement on Natural Gas and Electric Price Indices
<a href="#">PL05-8-000 and RM04-4-000</a>	June 16, 2005	Policy Statement on Creditworthiness for Interstate Natural Gas Pipelines Order Withdrawing Rulemaking Proceeding
<a href="#">Order No. 2005-A</a>	June 1, 2005	Regulations Governing the Conduct of Open Seasons for Alaska Natural Gas Transportation Projects (Final Rule)
<a href="#">RM05-12-000</a>	May 27, 2005	Modification of Natural Gas Reporting Regulations
<a href="#">Order No. 587-S</a>	May 9, 2005	Standards for Business Practices of Interstate Natural Gas Pipelines, as corrected by <a href="#">errata notice</a> issued June 14, 2005 (Final Rule)
<a href="#">Order No. 2005</a>	February 9, 2005	Regulations Governing the Conduct of Open Seasons for Alaska Natural Gas Transportation Projects
<a href="#">Order No. 2004-C</a>	December 21, 2004	Standards of Conduct for Transmission Providers (Final Rule)
RM05-1-000 (NOPR)	November 15, 2004	Regulations Governing the Conduct of Open Seasons for Alaska Natural Gas Transportation Projects
Order No. 2004-B	August 2, 2004	Standards of Conduct for Transmission Providers (Order on Rehearing) (Final Rule)
Order No. 644 (RM03-10-001)	May 19, 2004	Order on Clarification of Code of Conduct to Jurisdictional Sellers (Final Rule)
Order No. 2004-A	April 16, 2004	Standards of Conduct for Transmission Providers (Order on Rehearing) (Final Rule)
PL03-3-001	December 12, 2003	Order on Clarification
Order No. 2004	November 25, 2003	Standards of Conduct (Final Rule)
Order No. 644	November 17, 2003	Code of Conduct to Jurisdictional Sellers (Final Rule)
PL03-3-000	July 24, 2003	Policy Statement on Natural Gas and Electric Prices
<a href="#">CP01-76-001</a>	December 19, 2001	Commission reactivates Cove Point LNG Facility
Order No. 637-B	July 26, 2000	Order Denying Rehearing Concerning Regulation of Short-Term Natural Gas Transportation Services (Final Rule)
Order No. 637-A	May 19, 2000	Order on Rehearing, Rehearing of Short-term Natural Gas Transportation Services, and Regulation of Interstate Natural Gas Transportation Services (Final Rule)
Order No. 637	February 9, 1999	Regulation of Short-term Natural Gas Transportation Services, and Regulation of Interstate Natural Gas Transportation Services (Final Rule)
<a href="#">Opinion 414-A</a>	July 29, 1998	Transcontinental Gas Pipe Line Corporation, et al., Order on Rehearing
<a href="#">RP93-109-012</a>	July 29, 1998	Williams Natural Gas Company, Order Granting Rehearing in Part,
<a href="#">RP93-109-011</a>	August 1, 1997	Williams Natural Gas Company, Order on Rehearing

<b>Docket No.</b>	<b>Date</b>	<b>Title</b>
<a href="#">Opinion 414</a>	August 1, 1997	Transcontinental Gas Pipe Line Corporation, et al., Opinion and Order Modifying Initial Decision
<a href="#">Order No. 636-C</a>	November 27, 1992	Order Denying Rehearing and Clarifying Orders 636 and 636-A (Final Rule)
<a href="#">Order No. 636-B</a>	November 27, 1992	Order Denying Rehearing and Clarifying Orders 636 and 636-A (Final Rule)
<a href="#">Order No. 636-A</a>	August 3, 1992	Denying Rehearing in Part, Granting Rehearing in Part and Clarifying Order 636 (Final Rule)
<a href="#">Order No. 636</a>	April 9, 1992	Restructuring of Interstate Natural Gas Pipeline Services (Final Rule)
<a href="#">Order No. 2002</a>	July 23, 2003	Hydroelectric Licensing (Final Rule)
<a href="#">Order No. 635</a>	July 23, 2003	Policy Statement on Consultation with Indian Tribes in Commission Proceedings (Final Rule)



**PROVISIONS AFFECTING NATURAL GAS PIPELINES**

The Energy Policy Act of 2005 (EPAcT 2005) conferred on FERC new authority and prescribed a number of specific tasks related to natural gas or natural gas markets for action by FERC. Below is a list of those tasks and authorities, and the status of FERC action on them.<sup>1</sup>

- 1) **Alaskan Natural Gas Pipeline:** In EPAcT section 1810, Congress directed FERC to report on its progress in licensing and constructing the Alaskan natural gas pipeline every 180 days after enactment. In its seventh report, submitted in 2008, FERC reported that the Denali Partnership continued with various pre-application processes before FERC, including a field study to evaluate a planned North Slope treatment plant, and that Alaska had chosen TransCanada Corporation as a licensee under its state program. Both Denali and TransCanada are preparing to conduct open seasons.
- 2) **FERC Coordination with the Commodity Futures Trading Commission (CFTC):** In EPAcT section 316, Congress directed FERC to conclude, within 180 days, a memorandum of understanding (MOU) with the CFTC to facilitate transparency in electric and natural gas markets by ensuring that the two agencies may obtain information from each other. (For example, FERC may request information regarding futures and options trading data, and CFTC may request information on energy markets.) FERC entered into a MOU with the CFTC beginning October 12, 2005, before the February deadline.
- 3) **Storage and Storage-Related Services:** In EPAcT section 312, FERC was authorized to allow a natural gas company to provide storage and storage-related services at market-based rates for new capacity (placed into service after the date of enactment) even if the company cannot demonstrate that it lacks market power. FERC issued a final rule on June 19, 2006, to amend its regulations to establish criteria for obtaining market-based rates for storage services even when a company cannot or chooses not to demonstrate that it lacks market power. FERC upheld this decision on November 16, 2006.
- 4) **Lead Agency Authority/Judicial Review:** In EPAcT section 313, FERC was designated as the lead agency for coordinating authorizations required under federal law – including federal delegation of authority to state agencies – for proposed natural gas projects subject to Natural Gas Act (NGA) sections 3 (LNG terminals) and 7 (new pipeline and storage facilities). This same section of EPAcT also created a new judicial review provision under which the federal court of appeals in which a project is proposed may review pertinent federal or state agency permitting decisions (other than FERC’s decision), and the court of appeals for the District of Columbia Circuit may review allegations of unreasonable delay or failure to act by permitting agencies. On October 19, 2006, FERC issued a final rule under which it will (1) establish a schedule for completion of its own review and reviews for authorizations by other federal and state agencies

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1 Sources: <http://www.gao.gov/new.items/d06968.pdf> (GAO report) and <http://www.ferc.gov/legal/maj-ord-reg/fed-sta/ene-pol-act.asp> (FERC website).

that may be necessary for a proposed project and (2) compile a record of each such agency decision, together with the record of FERC's own decision, to serve as a consolidated record in judicial review proceedings. In the first judicial review action under this EPAAct provision, the United States Court of Appeals for the Second Circuit, remanded a state agency decision denying a Clean Water Act certification, but ultimately affirmed the state agency's decision to "veto" the project. *Islander East Pipeline Co. v. McCarthy*, 525 F. 3d 141 (2d Cir. 2008). The Supreme Court declined to review the case.

- 5) **Price Transparency:** In EPAAct section 316, Congress directed FERC to facilitate price transparency in markets for the sale or transportation "of physical natural gas" in interstate commerce, and provided that FERC "may prescribe such rules" as it determines necessary to carry out those transparency goals. FERC has since adopted regulations requiring all participants in the natural gas commodity market to report their natural gas sales that may affect price indices for natural gas (new annual Form No. 552) and required pipelines to post certain daily gas flow information. See discussion of New NGA section 23 on page 57.
- 6) **Anti-Manipulation Rules:** In EPAAct section 315, Congress amended the NGA to make it unlawful for any entity to use "any manipulative or deceptive device or contrivance," in connection with the purchase or sale of natural gas or transportation service subject to FERC's jurisdiction, in contravention of "such rules and regulations as [FERC] may prescribe . . . for the protection of natural gas ratepayers." Previously, FERC could only penalize behavior that manipulated natural gas commodity prices for a limited set of transactions, such as those by owners of interstate pipelines and other entities transporting natural gas on an interstate pipeline. This EPAAct provision expanded coverage to producers, financial companies, local utilities, and natural gas traders, most of which were not previously regulated by FERC. FERC issued a statement of its enforcement policy on October 20, 2005, and issued anti-manipulation rules on January 19, 2006, broadening FERC's oversight of natural gas sales. According to the GAO, FERC's Office of Enforcement expanded its monitoring of markets and its investigation of potential violations of its new anti-manipulation rules and has dedicated more time and staff efforts analyzing transactions and other market behavior in venues previously outside FERC's jurisdiction (e.g., analyzing the effect of financial market transactions on commodity prices). The GAO also reports that proving market manipulation is harder than it was before EPAAct 2005. Instead of proving that the market behavior had a "foreseeable" effect on market prices, conditions, and rules, FERC must now prove that the conduct that resulted in allegedly manipulated prices is intentional or reckless. FERC staff nevertheless reported to GAO that their efforts to implement the new authority are already having tangible results outside of FERC's anti-manipulation activities. Specifically, following the issuance of FERC's Policy Statement on Enforcement in October 2005, which explained the new market manipulation rules and higher penalties (see below), some industry members have "self-reported" instances of non-compliance with FERC-approved rules in an effort to gain FERC's consideration for a lesser penalty.
- 7) **Penalties:** In EPAAct section 414, Congress amended NGA section 21, 15 U.S.C. § 717t, by providing for increased criminal penalties for violations of the NGA, and by providing FERC with new authority to assess civil penalties of up to \$1 million per day per violation under newly-designated NGA section 22, 15 U.S.C. § 717t-1.



# THE NATURAL GAS ACT

The Natural Gas Act (NGA), enacted in 1938, was the first instance of direct federal regulation of the natural gas industry. The basic regulatory scheme included NGA sections 4 and 5, 15 U.S.C. §§ 717c and 717d, conferred on the Federal Power Commission (FPC) the authority to regulate the transportation and the sale for resale of natural gas in interstate commerce under a “just and reasonable” standard.<sup>1</sup> The FPC could review pipeline-proposed rate changes under NGA section 4, and could consider complaints against existing rates, and set new rates, under section 5. NGA section 7, 15 U.S.C. § 717f, conferred on the FPC the authority to issue certificates of “public convenience and necessity” authorizing construction and operation of facilities used in interstate gas transportation, and required Commission approval prior to abandonment of any pipeline facility or services.

These basic regulatory functions under the NGA originally resided in the FPC, and subsequently transferred to the FERC and to the Department of Energy in 1977, by the Department of Energy Organization Act. The DOE Organization Act created the Federal Energy Regulatory Commission, which now exercises authority under the NGA (but for the authority to authorize imports and exports of natural gas, which remains with DOE).

The NGA has had an enormous impact on the interstate natural gas market in the United States. Although the natural gas industry has undergone tremendous change since 1938 – most notably the virtual deregulation of natural gas commodity prices and the fact that pipeline companies now provide only transportation service rather than a bundled gas sales and transport service – the basic economic regulatory scheme adopted in 1938 continues to provide the framework for natural gas regulation in the United States. Concern about market power continues to be a key driver of natural gas regulation and monitoring of the market.

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<sup>1</sup> Under NGA section 1, 15 U.S.C. § 717, production, gathering, and local distribution of natural gas which were specifically excluded, and left to be regulated by the states.





# PIPELINE POSTING AND TRANSPARENCY REQUIREMENTS

Various provisions of the Natural Gas Act (NGA) impose a very high standard of transparency on interstate natural gas pipelines. NGA section 4(c), 15 U.S.C. § 717c(c), requires pipelines to file with FERC and “keep open in convenient form and place for public inspection,” schedules or tariffs showing all their rates and charges for natural gas transportation and sale, and “the classifications, practices, and regulations affecting such rates and charges,” along with all their contracts “which in any manner affect or relate to such rates, charges [etc.]” NGA section 8(a), 15 U.S.C. § 717g(a), requires pipelines to “make, keep, and preserve . . . such accounts, records of cost-accounting procedures, correspondence, memoranda, papers, books, and other records as [FERC] may . . . prescribe as necessary or appropriate[.]” Section 8(b) affords FERC access “at all times” to “inspect and examine all accounts, records, and memoranda . . .” and pipelines are obligated to furnish FERC “any information with respect thereto” and to “grant to all agents of the Commission free access to its property and its accounts, records, and memoranda when requested so to do.” In addition, NGA section 8(c) makes the “books, accounts, memoranda, and records of any person who controls directly or indirectly a natural-gas company” subject to examination by FERC. Finally, NGA section 10(a), 15 U.S.C. § 717(i)(a), requires pipelines to file special and periodic reports. This provision is the source of the extensive annual “Form 2” financial reports filed by pipelines, along with the quarterly “3-Q” reports.

Pursuant to regulations that FERC has issued under these and other statutory provisions, pipelines are required to post on their internet web sites very lengthy tariffs that contain information and data concerning their operations and business, including (1) transactional reports; (2) reports of customer discounts; (3) an index of customers; (4) the amount of capacity that is operationally available, and the amount that is unsubscribed; (5) maintenance schedules; (6) damage and service interruption reports; and (7) information about affiliated companies.

New NGA section 23, 15 U.S.C. § 717t-2 (EPAAct section 316), confers on FERC authority to issue rules to facilitate price transparency in natural gas commodity as well as transportation markets. Pursuant to this new provision, FERC now requires all natural gas commodity participants to file annually, on new form 552, information on the volume of their transactions. Pipelines must report certain operational transactions (e.g., “cash-outs” and balances) that involve natural gas sales which reference or potentially impact price indices. In a second initiative under this new transparency provision, FERC now requires major intrastate pipelines to post daily gas flow information. Interstate pipelines, which were already required to post scheduled flows, now also must post volumes of unscheduled “no-notice” service.





# OTHER LAWS AND REGULATIONS AFFECTING INTERSTATE PIPELINES

## **NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (42 U.S.C. § 4331 ET SEQ.)**

Any major action undertaken by the Commission in connection with a natural gas infrastructure project will implicate the National Environmental Policy Act (NEPA). NEPA requires federal agencies to integrate environmental values into their decision-making processes by including, in every major federal action significantly affecting the quality of the human environment, a detailed statement (environmental impact statement or EIS) of the environmental impact of the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, and alternatives to the proposed action. 42 U.S.C. § 4332. The primary purpose of the EIS is to serve as an “action-forcing” mechanism to insure that policies and goals defined in NEPA are “infused into the ongoing programs and actions” of the Commission. 40 C.F.R. § 1502.1 (2006). NEPA is intended to insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken by a federal agency. 40 C.F.R. § 1500.1(b). The Council on Environmental Quality has promulgated NEPA implementing regulations applicable to and binding on all federal agencies, 40 C.F.R. § 1500.3, and the Commission has its own NEPA regulations, 18 C.F.R. Part 380.

If the Commission anticipates that a proposed activity will significantly impact the human environment, the Commission may directly proceed to prepare an EIS. If the Commission is unsure of whether there are significant environmental impacts associated with the proposed activity, the Commission may first prepare an environmental assessment (EA), which briefly provides the public sufficient evidence and analysis for determining whether the Commission must prepare an EIS. 18 C.F.R. § 380.2(d)(1). If the Commission concludes, based on the EA, that the action will not have a significant effect on the human environment, it will issue a document, known as a “finding of no significant impact,” presenting the reasons why the action will not have such a significant effect, after which an EIS need not be prepared. In addition, the Commission has determined that certain activities do not have a significant effect on the human environment and therefore are to be categorically excluded from the detailed environmental analysis required by NEPA. 18 C.F.R. §§ 380.2, 380.4.

The “heart” of the EIS is the discussion of alternatives to the proposed action. 40 C.F.R. § 1502.14 (2006). The EIS is to “rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their being eliminated.” 40 C.F.R. § 1502.14(a). The alternative of “no action” must be considered. 40 C.F.R. § 1502.14(d). In order to conduct the alternatives analysis, the EIS must briefly specify the underlying “purpose and need” for the proposed action, 40 C.F.R. § 1502.13, and must discuss the environmental impacts of the proposed action and alternatives. 40 C.F.R. § 1502.16. The EIS should also include appropriate mitigation measures not already included in the proposed action. 40 C.F.R. § 1502.14(f).

After preparing a draft environmental impact statement and before preparing a final environmental impact statement, the Commission will seek comments from other agencies with jurisdiction over the proposed project, the applicant and the public. 40 C.F.R. § 1503.1.

The Energy Policy Act of 2005 amended the Natural Gas Act (NGA) to provide that the Commission shall act as the lead agency for purposes of complying with NEPA with respect to an application for a certificate of public convenience and necessity under section 7 of the NGA. 15 U.S.C. § 717n(b)(1). As the lead agency, the Commission is to supervise the preparation of the environmental impact statement if more than one federal agency is involved in the same action. 40 C.F.R. § 1501.5(a).

While NEPA is intended to ensure that federal agencies take environmental impacts into account when undertaking major federal actions, the U.S. Supreme Court has clarified that the NEPA is a procedural statute:

*NEPA itself does not mandate particular results, but simply prescribes the necessary process. If the adverse environmental effects of the proposed action are adequately identified and evaluated, the agency is not constrained by NEPA from deciding that other values outweigh the environmental costs . . . Other statutes may impose substantive environmental obligations on federal agencies, but NEPA merely prohibits uninformed - rather than unwise - agency action.*

Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 350-51 (1989) (internal citations omitted).

#### **FEDERAL WATER POLLUTION CONTROL ACT (“CLEAN WATER ACT”) (33 U.S.C § 1251 ET SEQ.)**

An applicant for a certificate of public convenience and necessity under section 7 of the NGA to construct an infrastructure project may be required to obtain various permits and authorizations for the project under the Federal Water Pollution Control Act, commonly known as the Clean Water Act (CWA).

Under section 401 of the CWA, an applicant for a federal license or permit to conduct any activity which may result in any discharge into the navigable waters of the United States must obtain a certification from the state in which the discharge originates (or will originate) that any such discharge will comply with certain water quality requirements of the CWA. 33 U.S.C. § 1341(a)(1). If the state fails or refuses to act on a request for certification within a reasonable period of time (not to exceed one year) after receipt of a request for certification, the state waives the certification requirement. *Id.* No federal license or permit may be granted until the certification has been obtained or waived. *Id.* If the state denies certification, section 401 prohibits the issuance of the federal license or permit. *Id.*

Section 404 of the CWA authorizes the United States Army Corps of Engineers (USACE) to issue permits, after notice and opportunity for public hearing, for the discharge of dredged or fill material into waters of the United States at specified disposal sites. 33 U.S.C. § 1344(a). Section 404 will apply to discharges of dredged or fill material into jurisdictional wetland areas or into streams, rivers, lakes, coastal waters or other water bodies or aquatic areas that qualify as waters of the United States. The USACE reviews applications for permits for the discharge of dredged or fill material in accordance with guidelines promulgated by the Administrator of the Environmental Protection Agency (EPA) under authority of section 404(b)(1) of the CWA (see 40 C.F.R. Part 230). 33 C.F.R. § 323.6(a). The EPA Administrator may transfer the administration of the section 404 permit program for discharges into certain waters to qualified states. 33 C.F.R. § 323.5.

Additional CWA permits may be required for a pipeline infrastructure project. For example, a national pollutant discharge elimination system (NPDES) permit may be required for the discharge of process or test water during construction or operation of pipeline facilities. 33 U.S.C. § 1342. EPA recently promulgated regulations pursuant to the Energy Policy Act of 2005 to exempt storm water discharges

associated with construction of natural gas pipelines from NPDES permit coverage, except in situations when the discharge of a pollutant other than sediment contributes to a violation of an applicable water quality standard. 40 C.F.R. § 122.26(a)(2)(ii). The scope of this exemption has been clouded, however, by a 2008 decision by the Ninth Circuit Court of Appeals. *Natural Resources Defense Council v. EPA*, 526 F.3d 591 (9th Cir. 2008). INGAA and others are pursuing this exemption through comments in an open EPA docket concerning effluent limitation guidelines. Effluent Limitations Guidelines and Standards for the Construction and Development Point Source Category, EPA Docket No. EPA-HQ-OW-2008-0465.

Section 313 of the Energy Policy Act of 2005 (EPAAct) amended section 15 of the NGA to require the Commission to establish a schedule for the issuance by federal agencies of all authorizations and opinions required by federal law, such as the CWA, with respect to an application for a certificate of public convenience and necessity under NGA section 7. See 15 U.S.C. § 717n. EPAAct section 313 also amended NGA section 19 to provide that the United States Court of Appeals for the circuit in which a facility subject to NGA section 7 certification is to be constructed or operated has jurisdiction to review – for consistency with federal law – any federal or state agency permitting or licensing decisions (if the agency decision is authorized by a federal law such as the CWA). 15 U.S.C. § 717r(d). Under that same EPAAct section, the United States Court of Appeals for the District of Columbia has jurisdiction to review complaints that such a federal or state agency has delayed action through a failure to act on an application for a permit or license subject to NGA section 7 certification.

#### **COASTAL ZONE MANAGEMENT ACT (16 U.S.C. § 1451 ET SEQ.)**

An applicant for a certificate of public convenience and necessity under section 7 of the NGA for an infrastructure project that may affect the coastal zone of a state must comply with the Coastal Zone Management Act (CZMA). The CZMA provides for management of the nation’s coastal resources, including the Great Lakes, and balances economic development with environmental conservation. The CZMA is administered by the National Oceanic and Atmospheric Administration (NOAA) at the Department of Commerce.

The CZMA requires that any applicant for a federal license or permit for an activity affecting any land or water use or natural resource of a state’s coastal zone certify to the federal permitting agency, as well as the affected state, that the applicant’s proposed activity complies with the enforceable policies of the state’s federally-approved coastal zone management program. 16 U.S.C. § 1456(c)(3)(A). The federal agency may not grant a license or permit for the proposed activity until the affected state has concurred with the applicant’s certification or until, by the state’s failure to act, the state’s concurrence is conclusively presumed, unless the U.S. Secretary of Commerce, on his own initiative or upon appeal by the applicant, finds that the activity is consistent with the objectives of the CZMA or is otherwise necessary in the interest of national security. *Id.*

The NGA applicant initiates the state’s CZMA review of the project, known as federal consistency review, by providing the federal permitting agency and the affected state with a certification of the consistency of the proposed activity with the enforceable policies of the state’s federally-approved coastal zone management program, as well as any “necessary data and information,” for the state’s review. 15 C.F.R. § 930.57 (2006). Once the state receives the consistency certification and all “necessary data and information,” the state will review the proposed activity for consistency and the state will have six months to object to or concur with the applicant’s certification. 15 C.F.R. §§ 930.60(a), 930.62(a) (2006). If the state fails to act within that six months, the state’s concurrence is conclusively presumed. 16 U.S.C. § 1456(c)(3)(A).

If the affected state objects to an applicant's consistency certification, the applicant may appeal the objection to the Secretary of Commerce. The Secretary of Commerce may override the state's objection if the activity is (a) consistent with the objectives of the CZMA or (b) otherwise in the interest of national security. 16 U.S.C. § 1456(c)(3)(A). As a threshold matter, the Secretary of Commerce may override a state's consistency objection if the objection is not in compliance with the requirements set forth in the CZMA or NOAA's implementing regulations for the state's consistency review. 15 C.F.R. § 930.129(b). Over the last several years, two proposed pipeline projects have appealed state objections to the Secretary of Commerce.

### **ENDANGERED SPECIES ACT (16 U.S.C. § 1531 ET SEQ.)**

Section 7 and section 9 are the two main substantive provisions of the Endangered Species Act (ESA) that may come into play with an application for a certificate of public convenience and necessity under section 7 of the NGA. Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. 16 U.S.C. § 1536(a)(2). Section 9 of the ESA makes it unlawful for any person to "take" any endangered or threatened species. 16 U.S.C. § 1538. "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. 16 U.S.C. § 1532(19). In turn, "harm" is defined by regulation to include modifications of a species' habitat that would injure a member of the species by significantly impairing its feeding, breeding or other essential activities. 50 C.F.R. § 17.3. There is an exception to the takings provision; the Secretary of the Interior may grant a permit for any taking otherwise prohibited by section 9 "if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." 16 U.S.C. § 1539(a)(1)(B).

Procedurally, section 7 of the ESA requires an agency proposing to take an action to inquire of the Fish and Wildlife Service (FWS) (or the National Marine Fisheries Service if the species is under their jurisdiction) whether any threatened or endangered species "may be present" in the area of the proposed action. 16 U.S.C. § 1536(c)(1). The Commission's regulations provide that the project sponsor serves as the Commission's non-federal representative for purposes of informal consultations with the FWS. 18 C.F.R. § 380.13(b)(1) (2006). Unless the FWS indicates that the proposed project is not likely to affect adversely a specific listed species or its designated critical habitat, the project sponsor must prepare a "biological assessment" to determine potential impacts that could result from the construction and operation of the proposed project on the listed species. 18 C.F.R. § 380.13(b)(5)(ii). If the assessment determines that a threatened or endangered species "is likely to be affected," the agency must formally consult with FWS. 16 U.S.C. § 1536(a)(2). During formal consultation, the Commission, the FWS and the applicant will coordinate and consult to determine potential impacts and mitigation that can be implemented to minimize impacts. 18 C.F.R. § 380.13(d)(2).

The formal consultation results in a biological opinion issued by the FWS. 16 U.S.C. § 1536(b); 18 C.F.R. § 380.13(d)(4). The biological opinion may conclude that: (1) the proposed action does not jeopardize endangered or threatened species or destroy or adversely modify critical habitat; (2) the proposed action does jeopardize endangered or threatened species or adversely modify critical habitat, but that there are reasonable and prudent alternatives that will avoid jeopardizing the species or adversely modifying critical habitat; or (3) the proposed action jeopardizes endangered or threatened species or adversely modifies critical habitat without alternatives. 50 C.F.R. § 402.14(h)(3). If the FWS determines that the project can go forward as proposed or as modified by a reasonable and prudent alternative, the biological opinion will include an "Incidental Take Statement" which sets forth terms and conditions for the agency action. 16 U.S.C. § 1536(b)(4). Any taking that is in compliance with the Incidental Take Statement "shall not be considered to be a prohibited taking of the species concerned." 16 U.S.C. § 1536(o)(2).

The same provisions of EPCRA section 313 with respect to FERC's scheduling and coordinating federal and state permitting decisions, and judicial review of such decisions (see discussion on page 56 under the CWA section) apply with respect to ESA decisions.

### **CLEAN AIR ACT (42 U.S.C. § 7401 ET SEQ.)**

An applicant for a certificate of public convenience and necessity under section 7 of the NGA for an infrastructure project may be required to obtain a variety of permits and authorizations under the federal Clean Air Act (CAA) and various state statutes that are designed to implement the requirements of the CAA.

The CAA is the primary federal statute for controlling air pollution in the United States. Both stationary sources of air pollution (e.g., factories, power generation facilities, etc.) and mobile sources (e.g., automobiles, trucks, backhoes) are regulated under the Act. As a result, the requirements of the CAA may apply to both the construction and operation of a pipeline infrastructure project, with the applicability of various requirements determined by a variety of factors, including the nature of the pipeline and associated infrastructure, the construction techniques used, and the existing air quality in the vicinity of the project.

With respect to natural gas pipeline operations, a pipeline itself generally does not have any significant air emissions associated with its operation; while there may be what are termed "fugitive emissions" from a pipeline, such emissions are generally very minor in nature and typically are not subject to the requirement to obtain a permit. The element of pipeline infrastructure projects that most commonly triggers the need for a CAA permit for operations is compressor stations. Such stations may trigger requirements under several CAA programs, including the New Source Review (NSR) and Prevention of Significant Deterioration (PSD) program and the permitting program for major stationary sources under Title V of the CAA.

The NSR program applies to new source construction and proposals to conduct major modifications of existing industrial facilities that are located in "non-attainment" areas (i.e., regions with poor air quality that do not satisfy the National Ambient Air Quality Standards), while the "Prevention of Significant Deterioration" requirements apply to project proposals that are located in areas that are in "attainment" with applicable National Ambient Air Quality Standards (i.e., ambient air quality in the region surrounding the new or modified source complies with the national standards). NSR and PSD requirements apply to facilities that are considered "major sources" of air pollutants because they would emit pollutants in excess of certain defined thresholds. Such facilities must undergo a review of potential air emissions and proposed air pollution control measures prior to construction of the facility.

In addition, Title V of the CAA requires that operating permits be obtained for "major sources" of air pollutants, which for purposes of Title V is defined to include stationary sources that have the potential to emit 100 tons per year of any regulated air pollutant, 10 tons per year of any one hazardous air pollutant or 25 tons per year of any combination of hazardous air pollutants. Title V permitting requirements may also apply to other sources of air emissions, including sources that are subject to certain standards governing emissions of hazardous air pollutants. In most cases, Title V permits are issued by state air pollution control authorities pursuant to state programs that comply with federal standards.



The Clean Air Act is the primary federal statute for controlling air pollution in the United States. The act may apply to both construction and operation of a pipeline infrastructure project.

The construction of pipelines and related infrastructure can also trigger a variety of CAA requirements due to air emissions – principally diesel emissions – from equipment used in the construction of the project. Depending on the magnitude of construction-related emissions, such emissions could trigger the need for NSR or PSD review. In addition, a pipeline may require a review for general conformity with a State Implementation Plan (SIP), i.e., a state plan for achieving compliance with various CAA requirements governing overall air quality. These SIPs may establish enforceable emission limitations for particular emission sources, permitting programs for the construction of new or modified air pollutant-emitting facilities, and other control measures applicable to emission sources within the state to ensure that the National Ambient Air Quality Standards will be achieved and maintained within each air quality control region within a state. The Commission may be required to determine that the construction and operation of a proposed pipeline would be consistent with the SIP of the state within which the pipeline would be located.

The same provisions of EPCRA section 313 with respect to FERC’s scheduling and coordinating federal and state permitting decisions, and judicial review of such decisions (see discussion on page 56 under the CWA section) apply with respect to CWA decisions.

#### **NATIONAL HISTORIC PRESERVATION ACT (16 U.S.C. § 470)**

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies, including the Commission, to consider the effects of an undertaking on historic properties – historic structures and historic artifacts – before authorizing the undertaking. See 16 U.S.C. § 470f; see also Office of Energy Projects, Federal Energy Regulatory Commission, Guidelines for Reporting on Cultural Resources Investigations for Pipeline Projects 1 (Dec. 2002). Under the Commission’s regulations, project sponsors assist the Commission in meeting its NHPA obligations. 18 C.F.R. § 380.14(a) (2006).

To comply with NHPA, a federal agency must consult with state historic preservation officers (SHPOs) and, when applicable, tribal historic preservation officers (THPOs) to ensure that historic properties in the “area of potential effect” of the project are identified, adverse effects on historic properties are assessed, and means for mitigating adverse effects are considered. 36 C.F.R. §§ 800.4, 800.5(a), 800.6(a). Under the Commission’s regulations, the project sponsor is to consult with the SHPO/THPO. See Office of Energy Projects, Federal Energy Regulatory Commission, Guidelines for Reporting on Cultural Resources Investigations for Pipeline Projects 6 (Dec. 2002).

The federal Advisory Council on Historic Preservation (ACHP), an independent federal agency established pursuant to the NHPA, may also participate in the consultation process; if the SHPO and the Commission disagree on historic properties or adverse effects, the ACHP may provide an opinion on the Commission’s finding. 36 C.F.R. §§ 800.4(d)(1)(iii); 800.4(d)(1)(iv)(A); 800.5(c)(2)(ii); 800.5(c)(3)(i). The Commission need only take into account the ACHP’s opinion before reaching a final decision. 36 C.F.R. § 800.4(d)(1)(iv)(B)-(C); 800.5(c)(3)(ii). If consultation between the Commission, the SHPO and, at times, the ACHP fails to resolve adverse effects on historic properties by developing ways to avoid, minimize or mitigate such adverse effects, the Commission may terminate consultation with the SHPO and other parties and proceed with approving the proposed project. 36 C.F.R. § 800.7(a). Although the ACHP comments on the Commission’s decision to terminate consultation, the Commission is only required to “take into account” the Council’s comments in reaching a final decision on the undertaking. 36 C.F.R. § 800.7(c)(4).

The same provisions of EPCRA section 313 with respect to FERC’s scheduling and coordinating federal and state permitting decisions, and judicial review of such decisions (see discussion on page 56 under the CWA section) apply with respect to NHPA decisions.

## THE PIPELINE SAFETY IMPROVEMENT ACT OF 2002

The Pipeline Safety Improvement Act of 2002 mandates significant changes and new requirements in the way that the natural gas industry ensures the safety and integrity of its pipelines. The Integrity Management Program (IMP) mandated in this law applies to natural gas transmission pipeline companies. Each pipeline operator is required to prepare and implement an integrity management program, that among other things requires operators to identify so-called “High Consequence Areas” (HCAs) on their systems, conduct risk analysis of these areas, perform baseline integrity assessments of each identified pipeline segment located in such HCAs, and reassess these segments on a periodic basis. Companies were required to identify all HCAs by December 17, 2004, and submit specific integrity management programs to the Pipeline and Hazardous Materials Safety Administration (PHMSA) at the U.S.

Department of Transportation. At least half of the identified pipeline segments within HCAs must have been inspected and remediation plans (if required) completed by December 17, 2008, while remaining HCA segments must be inspected and remediated by 2012.

Other provisions of the law include:

- ▶ Participation in planned-excavation one-call notification programs,
- ▶ Increased penalties for violations of safety standards,
- ▶ “Whistle-blower” protection for pipeline system employees,
- ▶ Qualification programs for employees who perform sensitive tasks,
- ▶ Authorization of some state participation in interstate pipeline oversight,
- ▶ A required multi-agency program of research, development, demonstration and standardization to enhance the integrity of pipelines,
- ▶ An interagency task force to expedite environmental reviews when necessary to expedite pipeline repairs, and
- ▶ Government mapping of the pipeline system and assembling pipeline operator contact information for public dissemination.

## THE PIPELINE INSPECTION, PROTECTION, ENFORCEMENT, AND SAFETY ACT OF 2006

This legislation, enacted in 2006, confirms the commitment to the IMP and other programs enacted in the 2002 legislation. It includes (1) provisions on IMP for natural gas distribution pipelines (including installation of excess flow valves on single family residential service lines on the basis of feasibility and risk); (2) standards for managing natural gas and hazardous liquid pipelines to reduce risks associated with human factors (e.g., fatigue); (3) authority for the Secretary to waive safety standards in emergencies; (4) authority for the Secretary to assist in restoration of disrupted pipeline operations; (5) review and update of



The Pipeline Safety Improvement Act of 2002 mandates significant changes and new requirements in the way that the natural gas industry ensures the safety and integrity of its pipelines.

incident reporting requirements; (6) requirements for senior executive officers to certify operator integrity management performance reports; and (7) clarification of jurisdiction between states and PHMSA for short lateral lines that feed industrial and electric generator consumers from interstate natural gas pipelines.

One of the primary focuses of the 2006 legislation was on preventing excavation damage to pipelines through the enhanced use and improved enforcement of state One-Call laws, i.e., laws that preclude excavators from digging until they contact the state or regional One-Call system to locate underground utilities. Excavators must report any damage caused by excavation activities. Violations are enforceable by U.S. Department of Transportation, including the assessment of civil penalties. Civil penalties may also be levied against any pipeline operator who fails to respond to a location request or fails to take steps, in response to such request, to ensure accurate marking of the pipeline location. The legislation also authorizes state grants to improve the effectiveness of damage prevention programs, and grants to organizations that develop technologies for prevention of third party excavation damage.



# NATURAL GAS PIPELINES AND CLIMATE CHANGE

Climate change and greenhouse gas (GHG) emissions management and reporting have emerged as leading international and domestic policy issues. Creating and implementing the appropriate response to climate change is an economic, trade and security issue that increasingly will dominate global and national policies and arguably poses the greatest economic, social, and environmental challenges of our time. Natural gas is a relatively low carbon clean burning fuel that can play an important role in a GHG mitigation strategy. Still, methane, the principal component of natural gas, is a potent GHG, and its control will be an important part of a comprehensive GHG mitigation strategy.

The primary GHG emissions attributable to the natural gas transmission industry include carbon dioxide (CO<sub>2</sub>) from combustion sources and methane (CH<sub>4</sub>) emissions from fugitive emissions (leaks) and venting. Methane emissions are especially important due to the global warming potential (GWP) of methane. GWP is the index that has been developed to compare different GHGs on a common reporting basis. It is a scaling factor that considers the radiative forcing effect of GHGs on a relative mass basis as compared to CO<sub>2</sub>. The commonly accepted GWP for methane is 21.

## CLIMATE CHANGE IS A GLOBAL PROBLEM

Unlike many environmental concerns, global climate change is unique because it cannot be solved at the local level alone. As all nations contribute to the problem of global climate change, so will each have a role to play in reducing greenhouse gas emissions worldwide. No one country or region can solve the problem of global climate change. The response must be global in nature.

In 1994, most countries joined an international treaty – the United Nations Framework Convention on Climate Change (Convention or UNFCCC) – to begin considering what could be done to reduce global warming and to cope with temperature increases. In December 1997, a number of nations approved an addition to the treaty, the Kyoto Protocol (KP), which established legally binding targets and timetables for certain Parties<sup>1</sup>. The major feature of the Kyoto Protocol is that it set binding targets for 37 industrialized countries and the European community to reduce GHG emissions. On average, each party must achieve a five percent reduction from 1990 levels by 2012.

It is important to make a distinction between CO<sub>2</sub> and methane GHG emissions and how the two are related.

CO<sub>2</sub> emissions come from combustion sources and are relatively easy to calculate. Methane emissions result from fugitive emission (leaks) and venting and are more difficult to calculate and control. Methane is often described by its CO<sub>2</sub> equivalent (CO<sub>2eq</sub>) - the amount of CO<sub>2</sub> equivalent to an amount of non - CO<sub>2</sub> gases adjusted by their Global Warming Potential (GWP).

Methane has a GWP of 21, which means it's 21 times more effective at preventing infrared radiation from escaping the planet. One ton of methane is 21 tons CO<sub>2eq</sub>.

Still, methane has an atmospheric lifetime of just 12 years, versus between 50 and 200 years for carbon dioxide.

<sup>1</sup> The Kyoto Protocol is subject to ratification, acceptance, approval or accession by Parties to the Convention. It entered into force on February 16, 2005.

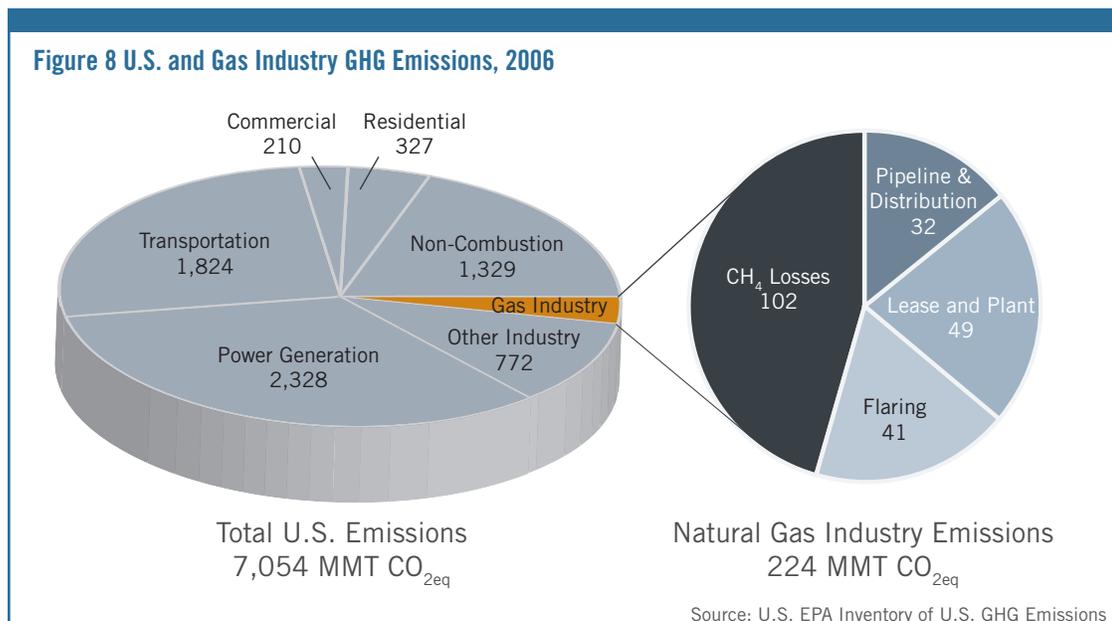
The major distinction between the KP and the Convention is that, while the Convention encouraged industrialized countries to stabilize GHG emissions, the Protocol commits them to do so.

Because developed countries are principally responsible for the current levels of GHG emissions in the atmosphere, the Protocol places a heavier burden on developed nations under the principle of “common but differentiated responsibilities.” With this in mind, the KP does not require that developing countries, such as China and India, take on mandatory reduction targets. Mainly due to concerns about United States competitiveness with countries that did not adopt mandatory reduction targets, in 1997, the U.S. Congress voted to make ratification contingent upon developing nations adopting mandatory targets. The treaty was never put before Congress for consideration and while the U.S. continues to work through the convention as well as develop a domestic response to climate change, it does not participate in any of the KP provisions. Through the UNFCCC process, Parties, including the U.S., continue to discuss potential future commitments.

Ultimately, efforts in the United States to reduce GHG emissions will have little impact on atmospheric concentrations of greenhouse gases if they are not coordinated with comparable efforts from other major emitting countries, including developing countries. At some point, a truly global effort will be required; the vehicle for that effort might be the UNFCCC or some other agreement. In any event, INGAA believes that the United States can and should take a leadership role by accelerating national efforts to reduce emissions, while conditioning any long-term commitments to achieve deep reductions on the adoption of comparable commitments from other major emitting countries. The United States can also lead through innovation by becoming a provider of advanced technologies to other countries.

### U.S. EMISSIONS FROM THE NATURAL GAS INDUSTRY

To understand better the role that natural gas pipelines may play as part of a regime for regulating U.S. GHG emissions, it is important to understand both the relative contribution that natural gas makes to total U.S. GHG emissions and how the natural gas value chain operates in the U.S. Total U.S. GHG emissions in 2006 were 7,054.2 million metric tonne (MMT). Of that amount, 5,681 MMT (80 percent) was CO<sub>2</sub> emissions from fuel combustion. Combustion of natural gas accounted for 1,155 MMT, 20 percent of the CO<sub>2</sub> from combustion and 16 percent of the total GHG emissions.



The natural gas industry had direct GHG emissions of 224 MMT CO<sub>2eq</sub> in 2006, which represented 3.2 percent of the total U.S. GHG emissions. The transmission and storage segment of the natural gas industry had emissions of 70.3 MMT CO<sub>2eq</sub>, less than one percent of the U.S. total. This included 32.1 MMT CO<sub>2</sub> from the combustion of “pipeline fuel” and 38.2 MMT CO<sub>2eq</sub> from the release of methane. Thus, direct emissions from pipelines were 70.3 MMT CO<sub>2</sub>, while the CO<sub>2</sub> content of gas throughput was 1,170 MMT CO<sub>2eq</sub>.

The natural gas transmission industry CO<sub>2</sub> emissions comprise just 0.5 percent of U.S. GHG emissions. Natural gas systems have a relatively small carbon footprint compared to overall emissions due to their small size and the low carbon content of natural gas. In fact, due to its low carbon content compared to other fossil fuels, natural gas can play a significant role in helping to reduce GHG emissions when used in place of other fossil fuels in end-use applications such as power generation, commercial or industrial applications.

<b>Carbon Content of Fossil Fuels</b>		
<b>Fuel Per MWh (2005 Average)</b>	<b>Metric Tons of Carbon per Billion Btu</b>	<b>Metric Tons of CO<sub>2</sub></b>
Coal	26.0	0.99
Oil	20.3	0.79
Natural gas	14.5	0.47

A solid understanding of the magnitude and origin of GHG emissions is critical for designing an effective greenhouse gases mitigation program. It also is important that emissions from the natural gas sector be measured accurately. With that in mind, INGAA has produced a tool to help measure GHG emissions from the natural gas transmission sector. The INGAA Greenhouse Gas Emission Estimation Guidelines for Natural Gas Transmission and Storage, Volume 1 – GHG Emission Estimation Methodologies and Procedures (GHG Guidelines) are intended to provide a reference point to assist INGAA member companies in completing calculations to estimate GHG emissions. The GHG Guidelines provide guidance for constructing an inventory – but do not prescribe the only acceptable approach.

### **DOMESTIC REGULATION OF GREENHOUSE GASES**

INGAA strongly supports continuing scientific analysis to inform the ongoing discussion of GHG regulation. This is especially important given the unique nature of GHGs and the global challenge of climate change, which presents a fundamentally different environmental concern than the regional pollutant emissions that are covered by laws such as the Clean Air Act (CAA) – a law that INGAA does not believe appropriate for controlling GHGs.

INGAA supports the development of a mandatory federal climate change program, enacted by Congress, that would preempt redundant and potentially conflicting state or regional initiatives. INGAA has encouraged lawmakers to ensure that climate change policies:

- ▶ Minimize the burden on the economy and do not cause undue harm to the natural gas pipeline industry and its customers;
- ▶ Recognize that the use of natural gas should be part of any such policy and do not discriminate against natural gas relative to other fossil fuels;
- ▶ Rely on market-based approaches that are simple to administer and provide clear price signals that enable industry to select the most efficient and cost-effective solutions;
- ▶ Recognize that, if a cap and trade policy is developed, the point of regulation, and consequent responsibility for possession and surrender of any allowances should not be placed upon service providers such as transporting pipelines;

- ▶ Ensure that early efforts to reduce GHG emissions are recognized and rewarded;
- ▶ Support research and development and appropriate funding for technology development to reduce greenhouse gas emissions, including those from natural gas transmission pipeline and storage facilities;
- ▶ Recognize and do not compromise the existing regulatory structure at the Federal Energy Regulatory Commission;
- ▶ Encourage the U.S. EPA and other agencies to adopt policies consistent with a national approach;
- ▶ Provide a new, comprehensive regulatory program that reflects the unique attributes and objectives of managing greenhouse gas emissions; and
- ▶ Do not disadvantage American industries relative to foreign counterparts.

A number of the climate change bills introduced in the U.S. Congress have proposed a “cap and trade” approach<sup>2</sup> for reducing GHG emissions from a wide variety of sources. One of the challenges in designing a GHG cap and trade program is how to regulate emissions associated with the use of natural gas, because the natural gas sector presents unique issues unlike those associated with designing a program for emissions from the combustion of coal and petroleum. In particular:

- ▶ The principal GHG concern associated with natural gas is CO<sub>2</sub> emissions from natural gas combustion. Natural gas end-users number in the millions, and include not only large industrial facilities and electricity generators, but also a wide variety of smaller commercial and residential users. The costs of participation in a cap and trade program could be prohibitive for these small volume end-users; still targeted programs such as efficiency standards and utility incentive programs, have proven effective and could make further contributions to reducing GHG emissions associated with natural gas combustion.
- ▶ From production to end-use, the natural gas supply chain involves a number of different types of entities. In a number of cases, rate regulation or market circumstances affect the extent to which these entities can pass through costs of environmental regulation.
- ▶ Both physical possession and, in many cases, ownership of the natural gas commodity change multiple times within the value chain between natural gas producers and end-use consumers; downstream regulation at the point of combustion eliminates administrative complications associated with upstream regulation.
- ▶ The natural gas sector also generates fugitive emissions of methane (another GHG), which are difficult to measure and monitor, but which can be addressed through operation and maintenance measures that seek to minimize fugitive emissions.

#### *Point of Regulation in a GHG Program*

A greenhouse gas cap and trade program could be designed as an “upstream” program in which producers, transporters and/or sellers of fuels or energy are required to obtain allowances; or it could be a “downstream”

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2 Cap and trade systems create a financial incentive for emission reductions by assigning a cost to polluting. First, an environmental regulator establishes a “cap” that limits emissions from a designated group of polluters, such as power plants, to a level lower than current emissions. Such a cap typically ratchets down over time until the ultimate goal for emissions reduction is achieved. The emissions allowed under the new cap are divided into individual permits or allowances—usually equal to one ton of pollution—that represent the right to emit that amount.

program in which consumers of energy are responsible for obtaining allowances for the fuels they use. An important component of either system is the point at which GHG are regulated and whether the program is structured in a manner that will be workable and efficient. While it was suggested at one time that pipelines be the point of regulation, there are significant reasons why interstate natural gas pipelines would be a poor selection as a point of responsibility in a GHG program.

#### *Key Attributes of GHG Cap and Trade Program*

To be workable and efficient, a cap and trade GHG program must provide consumers with price signals that create incentives for conserving fuels and/or switching to fuels with less severe GHG impacts. This means that the full cost of the emissions allowances (allowances) — the price signal that will motivate the decisions that should be the object of GHG policy — should flow through to those who are in the best position to influence their emissions: end-users.

A workable and efficient GHG program should also be comprehensive; that is, it should cover the largest possible amount of GHG emissions. This will spread the adjustment processes more widely and fairly and reduce the total social cost of achieving compliance (by finding the lowest-cost source of conservation or switching) without creating incentives for strategic behavior to bypass the program.

Once the first two criteria are met, the program should be manageable from an administrative perspective by minimizing the number of points of regulation to the greatest extent possible, by employing a transparent accounting mechanism that requires as little new information as possible while avoiding duplicative regulation of any energy or fuel delivered to consumers. While administrative efficiency is an important concern, it cannot be the determinative variable in making critical program decisions, such as where to establish the point of regulation.

#### *The Problems with Making Natural Gas Pipelines the Point of Responsibility*

As mentioned, a particularly important question is whether to adopt upstream, midstream or downstream approaches to GHG regulation of the natural gas sector. Upstream and midstream approaches would limit emissions from end-users by regulating the entities that produce, process, transport or distribute natural gas, even though these entities have no direct control over combustion, the primary source of emissions. For example, as presented in Senate Bill 2191 (the Lieberman-Warner Climate Security Act of 2007) in the 110th Congress, natural gas processors would have been required to acquire and retire emission allowances equal to the CO<sub>2</sub> emissions potential of their natural gas throughput. The fundamental assumption implicit in this approach is that this cost would be passed through to consumers of gas, providing the same economic incentive for reductions as regulation at the point of emissions (downstream).

As discussed above, a basic criterion for selecting the points of regulation for a cap and trade program is the ability to pass through allowance costs (for upstream approaches). Selecting interstate natural gas pipelines as the point of regulation could present substantial problems, particularly with regard to cost pass through.

#### **WHAT IS A CAP AND TRADE SYSTEM?**

Cap and trade systems create a financial incentive for emission reductions by assigning a cost to polluting. First, an environmental regulator establishes a “cap” that limits emissions from a designated group of polluters, such as power plants, to a level lower than their current emissions and perhaps ratcheted down over time. The emissions allowed under the new cap are then divided up into individual permits—usually equal to one ton of pollution—that represent the right to emit that amount. These are also called allowances. After the allowances are initially distributed, entities would be free to buy and sell them (the “trade” part of the program).

Interstate transmission pipelines do not own the natural gas they transport. Like common carrier trucking firms, interstate transmission pipelines are transportation service providers. Thus, increasing the price for transportation service would not necessarily increase the resale price of the natural gas commodity. Moreover, interstate pipeline transportation rates are subject to rate regulation by the Federal Energy Regulatory Commission and new costs cannot be passed through without FERC approval.

Pipelines likely will experience discontinuities in their efforts to pass through allowance costs. The models calling for upstream regulation assume that allowance costs will reach end-users. While interstate pipelines have a reasonable expectation that regulators will authorize a mechanism for recovering from ratepayers the costs incurred as a result of a mandatory carbon control program, due to market realities there remain significant risks that pipelines would not realize 100 percent cost pass through.

Even in cases in which a pipeline is allowed a rate that provides for full recovery of its regulatory costs, it might not charge this maximum rate, due to the wide-spread market practice of competitive discounting. Given these obstacles, among other considerations, an approach that would impose the allowance requirement directly on the pipelines likely will not result in efficient cost pass through.

### **INCREASING EFFICIENCIES AND BRINGING GAS TO MARKET**

The natural gas industry can play a key role in contributing to the reduction of greenhouse gas emissions, primarily by bringing gas to market in the most efficient and cost effective manner. Stimulating technology is and will continue to be a key component. INGAA supports a strong and diverse research and development (R&D) effort related to climate change mitigation. The need for new technology is broadly acknowledged by all participants in this debate. Any future response to GHG mitigation will be based on a wide array of new technologies encompassing supply and end-use energy efficiency, diverse energy sources and new energy technologies. INGAA members have been leaders in implementing technologies that have already yielded significant GHG reductions through the EPA STAR programs.

### **CONCLUSION**

The legal and business risks, as well as business opportunities, associated with GHG emissions are rapidly evolving in the U.S. as part of the global trend toward GHG restraints to address climate change. While no mandatory GHG emission reduction obligations currently exist for natural gas transmission companies in the U.S., the natural gas pipeline sector will be affected as these policies develop.

As the U.S. economy moves to reduce GHG emissions, natural gas will have an important role to play. The role of natural gas as bridge fuel, balancing energy demand, energy security, and environmental goals, may be a long one — lasting several decades — because natural gas is the cleanest burning fossil fuel. Natural gas is already recognized as a clean source of fuel for generating electricity and, in fact, is the fuel that has been selected for the vast majority of new electrical generating capacity built in the U.S. over the last decade. Also, natural gas is a vital, value-added feedstock in chemical manufacturing and many other industries, and it is an extremely efficient and cost effective fuel for space heating, water heating, stovetops and other direct uses.

A well balanced energy portfolio is needed, employing all fossil fuels, renewable sources, nuclear and hydro facilities. The deployment of new nuclear generating stations and clean coal technologies (e.g., IGCC and carbon sequestration) will take years to achieve significant market penetration and, during this transition period, natural gas-fired power plants will be one of the few low-emissions alternatives for generating the electricity needed to keep pace with increasing demand (as well as the capacity needs that may result from the retirement of less efficient and higher emitting older generators). And, while solar and wind power will play an increasing role in meeting our nation's energy needs, these technologies will depend on natural gas-fired generation to compensate for their intermittent availability.



# PIPELINE SECURITY

## OVERVIEW

Natural gas pipelines, which transport approximately 25 percent of the energy consumed in the United States, are an essential part of the Nation's infrastructure. This transportation infrastructure must be both reliable and resilient. Whether the threat is natural causes, terrorist activities or careless excavation, the inherent design and operation of the natural gas pipeline system reduces the probability that an incident will have a significant adverse impact on the Nation. Many of the inherent characteristics of the natural gas pipeline system that contribute to public safety in the vicinity of a pipeline also minimize the impact on energy delivery should terrorist activity target a pipeline. Still, the natural gas pipeline industry has been diligent in taking additional steps to safeguard critical facilities against terrorist threats and to ensure the ability to recover from any such incident on an expedited basis.

The industry's concerns are twofold. First and always, pipeline companies are concerned for the well-being of people who might be at the point of incidence of any disruption; the citizens who might live or work near a pipeline if a disruption occurs along a pipeline route and the pipeline employees and contractors. In both cases, the concern is that escaping natural gas can ignite. Still, relative to other potential terrorist targets, there is a low probability of fatalities and injuries at the point of disruption, because the majority of the interstate pipeline infrastructure is located in remote, sparsely populated areas and is buried underground. Furthermore, emergency responders and natural gas company personnel are trained, and continually receive additional training, to control such an event.

Beyond the point of disruption, a second broader concern is the consequences of a loss of natural gas service to the thousands of individuals, businesses, industries and electric generators that rely directly or indirectly on the supply provided by the interstate pipeline. The loss of natural gas supply for an extended period during the winter (and potentially during the summer for regions that rely on natural gas-fired electric generators to meet peak air conditioning demands) could have an adverse effect on consumers and the economy within a region affected by a natural gas pipeline disruption. Homeland security and pipeline industry personnel now are focusing their prevention and recovery planning on the potential disruption of natural gas supply as the primary issue to be addressed in connection with any natural gas pipeline incident.

The pipeline industry has demonstrated consistently that it is committed to being a proactive, cooperative partner with the federal government in strengthening pipeline security:

- ▶ The pipeline sector established industry security guidelines ahead of other critical infrastructure sectors;
- ▶ The industry initiated proactive studies to focus resources on critical facilities;
- ▶ The industry formed one of the first sector security coordinating councils; and
- ▶ Pipeline companies have consistently received positive feedback from federal assessments and audits.

Working closely with local, state and federal officials, natural gas pipeline companies regularly update and test security systems and procedures to minimize the likelihood of intentional breaches and improve the response time should a terrorist event occur. In fact, as part of its historic focus on pipeline safety, the industry has spent years developing safety and security measures designed to ensure that pipelines continue delivering natural gas to dependent consumers and businesses across the country. These security measures include, but are not limited to, round-the-clock monitoring, ground and aerial surveillance, timely maintenance services, backup safety systems and quick recovery procedures.

Working closely with local, state and federal officials, natural gas pipeline companies regularly update and test security systems and procedures.

On September 11, 2001, INGAA members went into a heightened alert status and remain vigilant today in working closely with local, state and federal officials to monitor the security of the pipeline network. Many of the procedures implemented on that day, and extensions thereafter, built on existing procedures developed as a result of the pipeline industry's proactive security efforts.

Activities associated with natural gas pipeline security, safety and reliability often overlap. Thus, while the Department of Homeland Security (DHS) is the lead federal agency for overall homeland security, the range of federal security responsibilities and activities relating to interstate natural gas pipelines is coordinated and shared among the Department of Energy (DOE) Office of Electricity Deliverability and Energy Reliability (OE), the Transportation Security Administration (TSA) within DHS, the Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA), and the Federal Energy Regulatory Commission (FERC).

#### **NATURAL GAS SECURITY – DETAILED INFORMATION**

The following section describes the structure and the specific actions taken by the federal agencies and the natural gas pipeline industry with regard to natural gas security.

Homeland Security Presidential Directive – 7 (HSPD-7), established seven Sector Specific Agencies (SSA) and designated to these agencies responsibility for protecting critical infrastructure within their respective areas of expertise. The President designated DOE as the lead SSA responsible for protecting the Nation's energy critical infrastructure, including "storage and distribution of oil and gas." Also in HSPD – 7, the President designated TSA as the lead SSA for transportation systems, including pipelines. HSPD -7 also references collaboration with DOT on security and infrastructure protection with respect to pipelines as a mode of transportation.

As part of its responsibility to provide overall security guidance, DHS developed a National Infrastructure Protection Plan (NIPP), which first was issued in June 2006. This is a well-developed road map for improving the security of a complex infrastructure by delegating the development of sector-based security plans that utilize a consistently implemented, risk-based methodology. This effort has assisted in developing a consistent strategy for diverse segments of the Nation's critical infrastructure.

To assist in implementing the NIPP with respect to natural gas and oil, DOE and TSA (under general guidance from DHS) formed advisory bodies consisting of the federal Government Coordinating Council (GCC) and the industry Oil and Natural Gas Sector Coordinating Council (ONGCC). The GCC includes representatives of TSA, DOE, PHMSA and FERC. The industry group includes representatives of the natural gas and oil industry value chain, including the American Petroleum Institute (API), Association of Oil Pipe Lines (AOPL), American Gas Association (AGA), American Public Gas Association (APGA) and the Interstate Natural Gas Association of America (INGAA). The ONGCC was one of the first sector coordinating councils established. The ONGCC and GCC have met regularly (2-3 times a year) since 2004.

Natural gas pipelines work with DOE/OE in maintaining the detailed Energy Sector Specific Plan (ESSP) required by the NIPP. Both advisory groups mentioned above provide the assistance needed to maintain an effective ESSP. The ESSP is the operative document for the natural gas industry in securing energy for the Nation.

As part of the Nation's transportation infrastructure, natural gas pipelines have developed the detailed Transportation Sector Specific Plan (TSSP) with TSA pursuant to the NIPP. Both advisory groups mentioned above assist in this effort as well.

Together, the NIPP, ESSP and TSSP provide strong guidance and coordination protocols for prevention, mitigation and recovery with respect to the natural gas pipeline infrastructure. Because the development of these plans was coordinated, the security plan for the industry has been optimized and focused.

The recently issued NIPP recommends the vulnerability assessment methodology that largely has been followed by the natural gas industry. So far, TSA reviews have verified that pipeline operators have applied a sound methodology.

An extensive multi-year effort by DOE, TSA and the pipeline industry to develop a methodology for a dynamic list of critical natural gas pipeline facilities and the consequences of disruption of those facilities has been completed and has been constantly updated. This provides the focus for resource deployment by both the ESSP and the TSSP.

TSA and PHMSA signed a Memorandum of Understanding (MOU) in August 2006 to assist in identifying their roles and responsibilities in connection with fulfilling their security missions. TSA and PHMSA have conducted over 100 audits of pipeline facilities utilizing both the practices recommended by PHMSA in 2002 and the AGA/INGAA Security Guidelines issued in 2002. In March 2003, pipeline operators were required to submit signed statements to DOT that they were following the elements of the DOT Pipeline Security Circular. The results of those audits and the subsequent recommendations on effective practices were presented to a large group of pipeline industry participants in November 2006. As part of this presentation, TSA highlighted successful practices.

TSA has conducted extensive cross-border reviews and exercises in coordination with Canadian authorities and with the Canadian pipeline companies that provide a significant portion of U.S. energy supply.

Recently, TSA promulgated a new set of security guidelines that are slated to replace the previously established PHMSA guidelines. These new guidelines incorporate the lessons learned of several years of operating under the previous guidelines and the impact of new technology. The largest change in these new proposed guidelines is the incorporation of recommendations addressing Supervisory Control and Data Acquisition (SCADA) systems.

FERC has developed regulations that require pipelines to report any impacts on the delivery of natural gas caused by a terrorist incident or major disaster that affects the performance of interstate natural gas pipelines. Additionally, FERC has provided the pipeline industry with the ability to recover increased security costs.

FERC has incorporated extensive security requirements into its regulations governing the new construction and expansion of liquefied natural gas (LNG) terminals and is monitoring those efforts with field and office audits. In addition FERC, PHMSA, and the FBI have established protocols for access to facilities subsequent to an incident.

The Coast Guard has issued security regulations and conducted audits for key offshore pipeline facilities and offshore portions of marine LNG facilities.

#### **DOE REGIONAL NATURAL GAS DISRUPTION PROJECT**

Following consultation with FERC, in the aftermath of 9/11, INGAA and AGA jointly sponsored a project to assess the capability of the Northeast natural gas market to withstand loss of regional pipeline transportation capacity in the event of a major pipeline disruption. The INGAA-AGA “Northeast Study” was issued in February 2003.

Building on the INGAA-AGA sponsored Northeast Study, DOE/OE initiated a project in September 2003 to assess flexibility of the natural gas markets in other U.S. regions to withstand loss of regional pipeline transportation capacity in the event of a major pipeline disruption. The project was intended to provide “information and analyses to assist development of effective policies and action plans to assure natural gas deliveries in the face of potential pipeline disruptions.” It includes an update of the original Northeast Study.

Funding for the project has been provided by DOE, TSA and FERC and the knowledge gained from this effort has been incorporated into the latest TSA security guidelines.



# PIPELINE SAFETY

## OVERVIEW

While owned and operated by the private sector, the over 300,000 miles of primarily underground natural gas transmission pipeline in the U.S. is a critical part of the Nation's energy infrastructure.<sup>1</sup> Responsibility for ensuring its safe and reliable operation is shared by industry operators and federal and state officials. Congress has updated the statutory framework for pipeline safety on a regular basis and in its oversight of the safety regulators. The combined effect is an increasingly safe natural gas transmission pipeline network.

While multiple modes of transportation such as barges, railroads, and highways frequently are used to deliver other fuels that are in a solid or a liquid state, the principal method to transport natural gas from the production areas to markets is through a pipeline. As the name implies, natural gas exists normally in a gaseous state. This affects how the fuel is transported. Natural gas is compressed to a high pressure and pushed through the pipeline by large compressors.

The primary safety concern is the flammability of natural gas, i.e., the fact that because of an accident, gas escaping from a pipeline accidentally might ignite. Since natural gas is composed primarily of methane and other hydrocarbons in smaller quantities, it is flammable when mixed with air at the right proportions as it rises through the atmosphere. At the accident site, pipeline employees, other contractors or the general public can be injured or property can be damaged if natural gas that escapes from pipelines ignites.

## INDUSTRY PIPELINE SAFETY ACTIVITIES

Pipeline safety is the natural gas pipeline industry's number one priority. Natural gas pipeline companies spend a large part of their operating budgets to ensure that pipelines run safely and reliably. Natural gas pipeline operators' history of commitment to safety is confirmed by studies showing that natural gas pipelines historically have been by far the safest mode of energy transportation in the United States.

Several reasons motivate natural gas pipeline companies' emphasis on pipeline safety. First and foremost is concern for the safety of those in the public community whose homes or businesses may be located adjacent to a pipeline, and, likewise, for the safety of employees and contractors working at compressor stations or at other points along the pipeline. Additionally, natural gas pipelines are part of the communities they pass through, and awareness of the presence of a pipeline and understanding the emphasis on pipeline safety are of paramount importance. Natural gas pipelines participate in community awareness programs to assist communities in understanding the elements of pipeline safety.

Natural gas pipeline companies also have inherent business reasons to ensure the safe operation of natural gas pipelines. The value of natural gas as an energy source to the public, and therefore the business value of pipeline companies, is highly dependent on maintaining the reputation of natural gas and its transportation as economic, safe, reliable and environmentally beneficial.

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<sup>1</sup> INGAA's members operate approximately 200,000 miles of this transmission pipeline structure that operate under interstate commerce. The remaining transmission pipeline mileage is operated by a mixture of intrastate pipelines, local distribution companies, and municipal gas companies.

Natural gas pipelines are highly engineered systems that are managed utilizing comprehensive design, construction, operating, inspection and maintenance practices and procedures. Many of these practices are based on international engineering consensus standards. Operators' pipeline safety programs are designed to prevent pipeline failures, detect anomalies that could compromise the integrity of the system and perform repairs. These practices often meet or exceed regulatory requirements. The pipeline industry continually strives to improve its safety and reliability record by directing and funding research and developing new engineering standards.

Natural gas pipelines monitor and control safety in many ways. No single tool or technique provides all the answers, but collectively these tools make natural gas the safest form of energy transportation. Continued investment is the key to maintaining a long-lived infrastructure such as a pipeline.

Over the years, INGAA members have developed and incorporated new technology into all aspects of their pipeline business. Investment in developing new technologies is a key component of continuously improving pipeline safety. Natural gas companies work with research and development (R&D) organizations, such as the Pipeline Research Council International (PRCI), the Gas Technology Institute (GTI) and others, to plan and support R&D investments, including participation in collaborative federal natural gas R&D programs within the Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA) and the Department of Energy, Fossil Energy Office. It is very important that industry and government work collaboratively to maximize the benefits that can be achieved with available funding.

Public education is a primary element of safety efforts by pipeline companies. The importance of education is emphasized in the federal and state programs and legislation described below. Public education and awareness contributes significantly to preventing unintentional third-party excavation damage, the leading cause of pipeline incidents.

Recently, the natural gas transmission pipeline industry has participated in a wide ranging discussion about the relationship of pipelines and communities. Sponsored by PHMSA, the Pipeline and Informed Planning Alliance (PIPA) is developing "best practices" to prevent encroachment on pipeline right-of-ways and to inform local planners on property development and emergency planning.

#### **"ONE-CALL SYSTEMS" AND STATE ACTIVITIES**

Excavation damage is the primary cause of fatalities and injuries associated with natural gas transmission pipeline incidents. State "One-Call systems" and individual state excavation damage protection systems are designed to combat this problem. One-Call systems provide contractors, highway workers, farmers and anyone digging along a pipeline right-of-way with the ability to call a single number to be sure it is safe to proceed. "Call-before-you-dig" notices are also sent to property owners along the right-of-way. Properly implemented, state One-Call systems have been highly effective in preventing excavation damage, and in providing a fair and impartial enforcement. Local authorities, excavation contractors, and pipeline operators are encouraged to utilize practices espoused by the Common Ground Alliance, a consortium of stakeholders focused on preventing damage to underground utilities.

The pipeline industry continually strives to improve its safety and reliability record by directing and funding research and developing new engineering standards.

Congress has recognized the importance of effective state One-Call systems. One of the primary focuses in the Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006 (further described on page 77) is on enhanced use of improved One-Call laws and systems and improved enforcement to prevent excavation damage to pipelines. The 2006 law includes prohibitions on excavators, sanctions on violators and incentives for states to revise One-Call programs to meet certain minimum requirements.

In addition to One-Call systems, states have the primary accountability for intrastate and local distribution pipeline safety. As noted, coordination with states and local communities is an important element in realizing the benefits of increased public education and pipeline safety awareness programs.

### **FEDERAL PIPELINE SAFETY ACTIVITIES**

The primary federal regulatory responsibility for pipeline safety rests with PHMSA within the Department of Transportation. Still, the activities of other federal agencies also contribute to the safety of our Nation's pipeline system. For example, the Federal Energy Regulatory Commission (FERC) is responsible for pipeline safety in connection with siting new interstate natural gas pipelines.

### **PHMSA SAFETY ACTIVITIES**

Pursuant to the first federal pipeline safety law enacted in 1969, pipeline safety regulation within PHMSA's predecessor began with prescriptive rules based on safety engineering consensus standards. These regulations have matured to include "risk management" concepts (allowing individual operators to identify and focus on risks unique to their pipelines) and "integrity management" philosophies that focus on life-cycle concepts. The interstate pipeline industry, working cooperatively with PHMSA, is taking affirmative steps in research and in developing consensus standards to make the pipeline infrastructure even safer.

Many of INGAA's members have developed sophisticated approaches for managing pipeline integrity. The recently developed PHMSA Integrity Management Program (IMP) embodies these concepts and applies this methodology consistently across the pipeline industry. (A more complete description of the IMP, its implementation and the progress to date is included at the end of this section.)

Natural gas pipeline professionals work closely with PHMSA in ensuring safety and reliability. The PHMSA regulations incorporate consensus engineering standards and practices and provide multiple layers of protection to the public by addressing the entire life-cycle of a pipeline. The regulations address pipe and component manufacturing, shipping of manufactured pipe, construction techniques, operating procedures and operator training, emergency response, and, ultimately, abandonment at the end of the pipeline's economic life. PHMSA enforces these regulations by utilizing various inspection and enforcement processes.

Pipeline accidents generally are reported to PHMSA when one of three things occurs: (1) a fatality, (2) an injury or (3) \$50,000 or more in property damage. Recently, PHMSA has categorized most "reportable incidents" either as "significant incidents" or as "serious incidents" (incidents that involve fatalities and injuries) and placed that data on its website. There is a downward trend in "serious incidents" on natural gas transmission pipelines from 1989-2005. Most "serious incidents" were caused by third-party excavation incidents rather than pipeline malfunction or pipeline deterioration. Overwhelmingly, natural gas transmission pipeline incidents that cause fatalities have been excavation or workplace safety related and include either a pipeline employee or a contractor.

PHMSA regulations require pipeline operators to conduct continuing public awareness programs to educate a wide range of stakeholders on pipeline safety issues. Current regulations require pipeline operators to develop and implement public awareness programs consistent with statutory requirements and the guidance provided by the American Petroleum Institute (API) Recommended Practice (RP) 1162, “Public Awareness Programs for Pipeline Operators,” which was developed jointly by the natural gas and oil pipeline industries and others. Under the regulations, operators of gas and hazardous liquid pipeline facilities must carry out continuing public education programs on:

- ▶ using a One-Call notification system prior to excavation and other damage prevention activities;
- ▶ possible hazards associated with unintended releases from a pipeline facility;
- ▶ physical indications that such a release may have occurred;
- ▶ steps that should be taken for public safety in the event of a pipeline release; and
- ▶ how to report such an event.

Operators must advise affected municipalities, school districts, businesses, and residents of pipeline locations. Operators must review their programs for effectiveness and enhance the programs as necessary.

PHMSA has also joined with the National Association of State Fire Marshals to form a “Partnership in Excellence in Pipeline Safety.” One of the first priorities under the partnership was developing an education and training program for emergency responders for effective and efficient response to pipeline incidents. Natural gas pipeline companies participated in the development of this program.

The information provided here is an overview of some, but not all, of PHMSA’s pipeline safety activities. The reader is encouraged to visit the PHMSA website for a complete description ([www.phmsa.dot.gov](http://www.phmsa.dot.gov)).

### **CONGRESSIONAL ACTION ON PIPELINE SAFETY**

Congress has been actively involved in pipeline safety. Congressional involvement dates back more than 40 years to the enactment of the Natural Gas Pipeline Safety Act in 1968. This law borrowed heavily from the engineering standards that had been developed over the previous decades. The goals of this federal law were to ensure the consistent use of best practices for pipeline safety across the entire industry, encourage continual improvement in safety procedures and verify compliance with those procedures. This statute is subject to reauthorization by Congress every three to four years. While subsequent reauthorization bills have improved upon the original, the core objectives of the federal pipeline safety law have remained a constant. The two most recent reauthorizations, in 2002 and in 2006, focused on standardizing integrity management practices and employee qualification programs, and enhancing state One-Call laws and systems and the improved enforcement of those laws.

#### *The Pipeline Safety Improvement Act of 2002*

(See Tab III.e for a description of this law.)

While historically the industry has had an excellent safety record, and has consistently strived for improvements, two incidents (Bellingham, WA, in 1999 involving an oil pipeline, and Carlsbad, NM, in 2000 involving a natural gas pipeline) increased the resolve of all parties to identify and implement further long-term improvements in pipeline safety. These efforts resulted in Congress enacting the Pipeline Safety Improvement Act of 2002 (PSIA), and PHMSA issuing its IMP rules pursuant to the PSIA.

Section 14 of the PSIA required operators of natural gas transmission pipelines to: (1) identify all the segments of their pipelines located in High Consequence Areas (HCAs) (areas adjacent to significant population); (2) develop an integrity management program to reduce the risks to the public in these HCAs; (3) undertake baseline integrity assessments (inspections) of all pipeline segments located in HCAs, to be completed within 10 years of enactment; (4) develop a process repairing any anomalies found as a result of these inspections; and (5) reassess these pipeline segments at least once every seven years thereafter to verify continued pipe integrity. This is the statutory basis for the PHMSA IMP program. See PHMSA Integrity Management Program – Implementation section below.

In addition, Congress encouraged the development of improved practices for excavation damage protection by utilizing the resources of the Common Ground Association. The PSIA also encouraged improved communication to raise public awareness about pipelines and the encroachment of communities on pipeline right-of-ways. The PSIA requires development of additional operator qualification programs to ensure that individuals are qualified to conduct the tasks they are assigned, and provides for grants to emergency responders to improve their preparation for an emergency, as well as the coordination of accident responses.

#### *The Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006*

(See Tab III.e for a description of this law.)

As noted, a primary focus in the 2006 legislation was to prevent excavation damage to pipelines through the use of enhanced state One-Call laws and systems and improve enforcement of those laws. Specifically, the legislation precludes excavators from digging until they contact the state One-Call system to locate the underground pipe and precludes them from digging in disregard of the markings. Excavators must report any damage caused by the digging and any escape of gas. Violations are enforceable by DOT, including imposition of civil penalties. Civil penalties are also available against any pipeline operator that fails to respond to a location request or fails to take steps, in response to such request, to ensure accurate marking of the pipeline location.

The 2006 reauthorization law also authorizes the Secretary of Transportation to issue grants to state authorities to assist in improving the effectiveness of states' damage prevention programs if certain program elements are met, including effective communications, fostering partnerships among stakeholders, review of performance measures, employee training, fostering public education, dispute resolution, enforcement, fostering use of improving technologies, and program effectiveness review. The Secretary also is authorized to make grants to organizations to develop technologies to facilitate prevention of third-party excavation damage.

#### **PHMSA INTEGRITY MANAGEMENT PROGRAM – IMPLEMENTATION**

The PSIA requires that integrity inspections be performed by one of the following methods: (1) an internal inspection device (or a “smart pig”); (2) hydrostatic pressure testing (filling the pipe with water and pressurizing it well above operating pressures to verify a safety margin); (3) direct assessment (digging up and visually inspecting sections of pipe selected based on various electronic measurements and other characteristics), or (4) “other alternative methods that the Secretary of Transportation determines would provide an equal or greater level of safety.” The pipeline operator is required by PHMSA regulations to repair all non-innocuous imperfections and adjust operation and maintenance practices to minimize “reportable incidents.”

Internal inspection devices/smart pigs are the primary means for assessing the integrity of natural gas transmission pipelines due to their versatility and efficiency. The other assessment methods enumerated in the 2002 reauthorization law are useful when smart pig technology cannot be used effectively.

Surveys conducted just prior to implementation of the IMP suggested that almost one-third of natural gas transmission pipeline mileage could immediately accommodate smart pigs, another one-quarter could accommodate smart pigs with the addition of permanent or temporary launching and receiving facilities, and the remainder, about 40-45 percent, would either require extensive modifications or would not be able to accommodate smart pigs due to the physical or operational characteristics of the pipeline (i.e., primarily older pipelines that were not engineered to accept such inspection devices). Scheduling these extensive modifications to minimize consumer delivery impacts has been one of the most challenging aspects of the IMP.

The natural gas pipeline industry will use hydrostatic pressure testing and direct assessment for segments of transmission pipeline that cannot be modified to accommodate smart pigs, or in other special circumstances that may arise. These inspection methods have drawbacks, because, they both require a pipeline to cease or significantly curtail gas delivery operations for a period of time. Hydrostatic testing also risks exacerbating some conditions while resolving others. Direct assessment necessitates excavation and subsequent disturbance of a landowner's property and disrupts other infrastructure, including roads and other utilities, creating a risk and an inconvenience to the public.

Finally, while pipeline modification and inspection activity generally can follow a pre-arranged schedule, repair work is unpredictable. A pipeline operator does not know ahead of time how many anomalies an inspection will find, how severe such anomalies will be, and how quickly they must be repaired. Only the completed inspection data can provide such information. Repair work often requires systems to be shut down even if the original inspection work did not affect system operations. The unpredictable nature of repair work must be kept in mind, especially during the baseline inspection period, when the number of required repairs is expected to be the greatest.

#### **INTEGRITY MANAGEMENT PROGRAM PROGRESS TO DATE**

PHMSA's Integrity Management Program is meeting Congressional objectives by verifying the safety of natural gas transmission pipelines located in highly populated areas and identifying and rectifying potential problems before they occur. Based on five years of data since the issuance of the IMP rule, the results are verifying that the natural gas transmission pipeline system is in very good condition and the IMP program is ensuring that it will maintain that status.

The industry is generally on track to meet the 10-year baseline requirement for inspecting High Consequence Areas (HCAs). The vast majority of the assessments to date have been completed using smart pig devices. These devices only can operate across large segments of pipeline – typically between two compressor stations. While 100-mile segment of pipeline may, for example, contain only five miles of HCA, the entire 100-mile segment between compressor stations must be assessed in order to assess that five miles of HCA. This dynamic is resulting in a large amount of “over-testing” on natural gas transmission systems. While it has completed assessments on 17,205 miles of HCA pipe thus far, the industry actually inspected over 116,814 miles of pipe through 2008 in order to capture the HCA segments. Any problems identified as a result of inspections, whether located in a HCA or not, are repaired. In summary, while only about seven percent of total natural gas transmission pipeline mileage is located in HCAs, it is anticipated that, due to over-testing situations, about 60 percent of total transmission mileage actually will be inspected during the baseline period.

The focus of PHMSA's IMP is on “time-dependent defects” (problems with pipelines that develop and grow over time and therefore can be managed by re-inspections on a periodic basis). The most prevalent time-dependent defect is corrosion. As such, the IMP effort focuses most intently on corrosion identification and mitigation.

As noted, the primary cause of pipeline incidents is excavation damage by third parties (this was the cause of more than 85 percent of the incidents in HCAs during the PHMSA study period). Most excavation damage incidents result in an immediate pipeline failure. Periodic assessments are unlikely to reduce the number of these incidents in any significant way.

Even though it is only halfway through the baseline assessment period, the data suggest a very positive conclusion regarding the present state of the natural gas transmission pipeline system and the effectiveness of the IMP. The number of incidents associated with time-dependent defects in HCAs is fairly low. As critical time-dependent defects are found and repaired, these incident and leak numbers should approach zero because the gestation period for these defects is significantly longer than the re-assessment interval. By completing identified immediate and scheduled repairs in a timely fashion, the pipeline industry is reducing the possibility of future reportable incidents or leaks.

Many of the natural gas pipelines being inspected under this program are 50 to 60 years old. While it is often hard for non-engineers to appreciate, well-maintained pipelines can operate safely for many additional decades. One important benefit of the IMP is the verification and re-establishment of the known safety factors on these older pipeline systems.

The Government Accountability Office (GAO) has reported that the IMP benefits pipeline safety. The GAO Report concludes:

*The gas integrity management program has made a promising start. The program's risk-based approach is supported by industry, state pipeline agencies, safety advocates, and operators. Although the national transmission pipeline system is extensive, much of the population that is potentially affected by a pipeline event is concentrated in highly populated areas, which will be provided additional protection through the program. Thus far, operators are successfully implementing the critical assessment and repair requirements, and their documentation concerns should be resolved as operators gain experience with the program and receive feedback during inspections. While the progress in implementing the program to date is encouraging, PHMSA and state oversight will be critical to ensure that operators continue to effectively implement integrity management. As the program matures, PHMSA's performance measures should allow the agency to quantitatively demonstrate the program's impact on the safety of pipelines. However, relatively minor changes in how some of the measures are reported could help improve their usefulness and PHMSA's ability to analyze and demonstrate the program's impact over time.*

GAO, Integrity Management Benefits Public Safety, but Consistency of Performance Measures Should Be Improved, GAO-06-946 (Washington, D.C.: September 8, 2006).





## IV. Joint Industry Initiatives



The Interstate Natural Gas Association of America



## IV. Joint Industry Initiatives



The Interstate Natural Gas Association of America

# IV

## JOINT INDUSTRY INITIATIVES

### **THE NATURAL GAS COUNCIL**

The Natural Gas Council (NGC) is a voluntary, unincorporated association, comprised of senior executives from the major segments of the natural gas industry. Its members represent the major North American natural gas trade associations. The purposes of the NGC are to: (1) provide a forum for the discussion of common concerns and policy issues of interest and benefit to the natural gas industry, and to move from dialogue toward resolution whenever possible; (2) remove impediments to the efficient use of natural gas; and (3) develop and advocate industry-wide positions in those areas where the industry is unified. The NGC operates strictly within the requirements of the antitrust laws.

The Council has four principal members: American Gas Association, Independent Petroleum Association of America, Interstate Natural Gas Association of America, and Natural Gas Supply Association. Associate members include: American Petroleum Institute, Canadian Association of Petroleum Producers, Canadian Energy Pipeline Association, Canadian Gas Association, Gas Processing Association, Asociación Mexicana de Gas Natural, Edison Electric Institute, Sutherland Asbill & Brennan LLP (representing Process Gas Consumers), and NGC founding member Alcorn Exploration, Inc.

In recent years, the Council has provided a forum for the development of consensus positions on specific technical and policy matters. The NGC worked on transparency issues related to price reporting of natural gas commodity price indices and prepared two technical white papers on natural gas interchangeability and hydrocarbon liquid drop out that the industry and the Federal Energy Regulatory Commission (FERC) have endorsed. (See Tabs III.d and III.a for more detailed information on transparency and natural gas quality.)

### **NATURAL GAS COUNCIL ECONOMIC MODELING OF GREENHOUSE GAS LEGISLATION**

Working in conjunction with the Natural Gas Council, INGAA took the lead on initiatives in 2007 and 2008 to model the economic consequences of pending greenhouse gas (GHG) legislation. The NGC used the National Energy Modeling System (NEMS), the same model that the Energy Information Administration (EIA) of the U.S. Department of Energy uses to support its energy outlook publications and to respond to requests from the Congress that it analyze the possible effects of pending legislation.

The NGC undertook these exercises to ensure that any GHG legislation that ultimately may become law is sufficiently flexible enough to address the environmental, economic and energy security implications of a range of possible outcomes that may occur as the energy economy adjusts to mandatory carbon constraints. The key difference between the NGC modeling exercises and EIA's modeling of pending GHG bills was that the NGC modeled a range of scenarios to demonstrate the significant uncertainty associated with how these bills could affect the economy if they become law.

The results of the NGC NEMS modeling demonstrate the critical role that is likely to be played by natural gas in the transition to a lower-carbon energy economy, particularly if other sources of energy and energy technologies cannot be deployed as quickly as might be hoped. The NGC modeled S. 3036, America's Climate Security Act of 2008, and S. 280, the Climate Stewardship and Innovation Act of 2007. While the NGC studies focused on these two specific pieces of legislation, the findings and lessons learned are applicable to other climate change proposals that may be introduced (see <http://www.ingaa.org/cms/33/1060/5565.aspx> for more information).

#### **JOINT INGAA/NGSA PETITION ON CERTIFICATE ISSUES**

In December of 2005, INGAA and NGSA jointly filed a proposal with FERC to expand the eligibility of blanket certificate activities for natural gas infrastructure projects. On October 19, 2006, FERC issued a final rule addressing the proposal. FERC's principle action was to increase the dollar limits on projects that are eligible for blanket processing from \$8.2 million to \$9.6 million for automatic authorizations and from \$22.7 million to \$27.4 million for projects that are subject to prior notice procedures. FERC declined to adopt INGAA's and NGSA's recommendation to adopt the substantially higher temporary limits that were authorized in the wake of Hurricanes Rita and Katrina. In addition, the final rule extended blanket eligibility to certain types of facilities that were previously excluded, including mainlines, storage field facilities, and facilities transporting revaporized liquefied natural gas (LNG).

Much of the new blanket authority will be subject to prior-notice review procedures, giving the public and FERC staff an opportunity to seek additional procedures. FERC also adopted new environmental regulations, including certain noise restrictions on compressors and clarified that it is not unlawfully discriminatory to charge different customers different rates for the same service based on the date customers commit to a new service. Several aspects of the rulemaking, including compressor station noise standards and landowner notification timeframes are pending the outcome of rehearing.



## V. Industry Terminology



The Interstate Natural Gas Association of America



## V. Industry Terminology



The Interstate Natural Gas Association of America

## V

## INDUSTRY TERMINOLOGY

## A

**Abandoned Well:** An oil or gas well not in use because it was a dry hole originally, or because it has ceased to produce in paying quantities. State statutes and regulations require the plugging of abandoned wells to prevent oil, gas, or water seeping from one stratum of underlying rock to another.

**Abandonment:** Termination of a sale or interstate transportation of natural gas. Abandonment of a service that is subject to FERC jurisdiction requires advance determination by the FERC under Section 7 (b) of the NGA that the “present or future public convenience and necessity” requires termination.

**Abandonment, Pregranted:** A provision of a FERC certificate of public convenience and necessity that authorizes abandonment on a future condition subsequent or on a date certain.

**Absolute Pressure:** See PRESSURE.

**Account No. 858:** Tracking system established by the FERC used by interstate pipelines for costs incurred transporting sales gas on upstream pipelines.

**Access:** The legal right to use a gas transmission and/or distribution system as a means of transferring natural gas as set forth in the contract.

**Acid Rain:** Also called acid precipitation or acid deposition, acid rain is precipitation containing harmful amounts of nitric and sulfuric acids formed primarily by nitrogen oxides and sulfur oxides released into the atmosphere when fossil fuels are burned. It can be wet precipitation (rain, snow, or fog) or dry precipitation (absorbed gaseous and particulate matter, aerosol particles or dust). Acid rain has a pH below 5.6. Normal rain has a pH of about 5.6, which is slightly acidic. The term pH is a measure of acidity or alkalinity and ranges from 0 to 14. A pH measurement of 7 is regarded as neutral. Measurements below 7 indicate increased acidity, while those above indicate increased alkalinity.

**Acquired Capacity Agreement:** Under capacity release, an agreement between a gas pipeline and an acquiring shipper which establishes the terms and conditions for the acquiring shipper using firm capacity rights from a releasing shipper.

**Acquiring Shipper:** In the context of capacity release, a shipper who acquires firm capacity rights from a releasing shipper (also known as “replacement shipper”).

**Actuals:** In the context of futures trading, actual cash commodities in contrast to futures commodities. In the context of ratemaking, actual costs and throughput data relating to a given time frame.

**Ad hoc Working Group on Further Commitments for Annex I Parties Under the Kyoto Protocol (AWG-KP):** The AWG-KP was established by Parties to the Kyoto Protocol in 2005 to consider further commitments of industrialized countries under the Protocol for the period beyond 2012, and is set to complete its work in at COP15 in 2009.

**Ad hoc Working Group on Long-Term Cooperative Action (AWG-LCA):** The AWG-LCA was established in 2007 to conduct negotiations on a strengthened international deal on climate change, set to be concluded at COP15 in 2009.

**Adjustment Clause or Provision (Rate Adjustment, Fuel Adjustment, Purchased Gas Adjustment, Tax Adjustment, Commodity Adjustment):** A provision in a utility tariff that provides for changes in rates or total charges with changes in specified items of cost, such as No. 2 or 6 fuel price, purchased gas, tax, etc.

**Administrative and General Overhead (A&G) Costs:** See COSTS, ADMINISTRATIVE AND GENERAL.

**Ad Valorem Tax:** Tax imposed at a percent of a value. Local property taxes are often ad valorem taxes.

**Agency Service:** An arrangement which allows a gas buyer to give an agent authority to act on the buyer's behalf to arrange or administer pipeline transportation and/or sales services.

**Aggregator:** A company that consolidates a number of individual users and/or supplies into a group.

**Allowance for Funds Used During Construction (AFUDC):** A non-cash accounting convention of regulatory utilities that represents the estimated composite interest costs of debt and a return on equity funds used to finance construction. The allowance is capitalized in the property accounts and included in income.

**Alternate Firm Receipt/Delivery Point:** Firm receipt or delivery point, not including primary points designated in a gas contract, at which a firm shipper may schedule gas receipt or delivery with a priority above that of interruptible service.

**Alternate Fuel Capability:** The ability of any user such as an industrial facility to use more than one fuel, whether or not the facilities for such use have actually been installed.

**Alternative Fuel Capacity:** The on-site availability of apparatus to burn more than one fuel.

**American National Standards Institute (ANSI):** The coordinating organization for U.S. federated national standards system. The ANSI federation consists of 1400 company, organization, government agency, institutional and international members.

**Anthropogenic Greenhouse Emissions:** Greenhouse gas emissions resulting from human activities.

**Arbitrage:** Trading the same security, currency, or commodity in two or more markets in order to profit from differences in prices.

**Arbitrageur:** An arbitrageur takes advantage of momentary disparities in prices between markets. Arbitrageurs make markets more efficient by bringing the prices in line with each other.

**As-Billed:** The methodology in natural gas pipeline rate design in which all charges that the pipeline paid for transportation, transition costs, etc., pass through to its customers in the same form, demand or commodity, by which those costs were charged to the pipeline.

**Asset:** An economic resource, tangible or intangible, which is expected to provide benefits to a business.

**Atmospheric Lifetime:** The approximate amount of time it would take for the anthropogenic increment to an atmospheric pollutant concentration to return to its natural level (assuming emissions cease) as a result of either being converted to another chemical compound or being taken out of the atmosphere via a sink.

**Atmospheric Pressure:** See PRESSURE, ATMOSPHERIC.

**At-Risk Condition:** A condition placed upon certificates of Public Convenience and Necessity issued by the FERC which places the responsibility for under-recovery of costs regarding pipeline expansion or new construction on the pipeline sponsor and/or new customers, rather than on the pipeline's other customers.

**Average Revenue per Unit of Gas Sales (By Class of Service):** Revenue from the sale of natural gas to a class of service, exclusive of penalties and forfeited discounts, divided by the corresponding number of units sold. Units may be therms, Btu, or cubic feet.

**Average Temperature:** The calculated average of the twenty-four hourly dry bulb atmospheric temperatures in degrees Fahrenheit recorded for each day. See MEAN TEMPERATURE.

## B

**Backhaul:** A "paper transport" of natural gas by displacement against the flow on a single pipeline, so that the natural gas is redelivered upstream of its point of receipt. See also DISPLACEMENT.

**Back-Stopping:** Arranging for alternate supplies of gas in the event a user's primary source fails to be delivered.

**Balancing:** Equalizing the volumes of gas withdrawn from a pipeline system with the volumes of gas injected into the pipeline. Penalties may be assessed for transportation imbalances beyond specified tolerances.

**Balancing Account:** A regulatory convention in which costs and revenues associated with certain utility expenses (e.g., fuel) are accumulated but on which no return is earned.

**Barrel:** A volumetric unit of measure for crude oil and petroleum products equivalent to 42 U.S. gallons.

**Baseline:** A projected level of future emissions against which reductions by project activities might be determined, or the emissions that would occur without policy intervention.

**Base Load:** The minimum amount of electric power or natural gas delivered or required over a given period of time at a steady rate. The minimum continuous load or demand in a power system over a given period of time usually not temperature sensitive.

**Base Rate:** A charge normally set through rate proceedings by appropriate regulatory agencies and fixed until reviewed at future proceedings. It is calculated through multiplication of the rate from the appropriate rate schedule by the level of consumption. It does not include components that may vary from billing cycle to billing cycle, such as fuel.

**Basis:** The difference between the spot or cash price of a financial instrument or commodity and the price of the futures contract or a related derivative instrument. A seller is “short of the basis” if selling spot goods hedged by the purchases of futures. Someone who is “long of the basis” has bought spot goods and hedged them by the sale of futures. A basis point is one percent of one percent.

**Bcf:** The abbreviation for 1 billion cubic feet of natural gas.

**Bidding Shipper:** A natural gas shipper bidding for capacity released by a firm capacity holder.

**Billing Cycle:** The regular periodic interval used by a utility for reading the meters of a customer for billing purposes. Usually meters are scheduled to be read monthly or bimonthly.

**Billing Demand:** The demand charge that a customer actually pays for the reservation of capacity or facilities used, regardless of consumption. Billing demand may be based on a contract maximum, a contract minimum, or a previous peak or maximum demand and, therefore, may not necessarily coincide with the actual measured demand for the billing period. Also referred to as Ratchet, or Ratcheted Demand Charge.

**Blanket Certificate (Authority):** General authorization granted by the FERC under NGA section 7 (c) for the recipient to engage in a FERC jurisdictional activity, such as transportation or sales of natural gas, on behalf of a general class of potential customers, without individual case-by-case review and approval.

**Blanket Sales Certificate:** The authorization granted to pipelines and/or their marketing affiliates, as well as other sellers, to sell natural gas for resale at market-based prices.

**Boiler:** A device for generating steam for power, processing, or heating purposes or for producing hot water for heating purposes or hot water supply. Heat from an electrical combustion source is transmitted to a fluid contained within the tubes in the boiler shell. This fluid is delivered to an end-user at a desired pressure, temperature, and quality. Boilers are often classified as steam or hot water, low pressure or high pressure, capable of burning one fuel or a number of fuels.

**Boiler Fuel:** Fuels suitable for generating steam or hot water in large industrial or electrical generating utility applications.

**Boiler Fuel Gas:** Natural gas used as fuel for the generation of steam or hot water.

**Book Cost:** The amount at which property or assets are recorded in a company’s accounts without deducting depreciation, amortization, or various other items.

**Book Transfer:** Transfer of title without a physical movement.

**British Thermal Unit (Btu):** The amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit.

**British Thermal Unit (Btu), Dry:** A measure of the heating value of natural gas that is free of moisture, or contains less than 7 pounds per Mcf of water vapor. Condition under which natural gas is usually delivered for first sales.

**British Thermal Unit (Btu), Saturated:** A measure of the heating value of natural gas that is fully saturated with water vapor under standard temperature, pressure and gravity conditions. This standard of measure usually has little or nothing to do with the state in which the natural gas is actually delivered for first sales.

**Broker:** A third party that earns a profit by establishing a transaction between a willing Seller and Purchaser without ever taking ownership.

**Btu:** See BRITISH THERMAL UNIT (BTU).

**Bubble Point:** The temperature and pressure at which a liquid begins to convert to a gas.

**Bundled Sales Service:** The sale and/or transportation of natural gas or electricity under one rate, which does not differentiate separate rate components for the sale, transportation, storage or gathering services associated with such sale or transportation.

**Burner Capacity (Burner Rating):** The maximum Btu per hour that can be released by a burner while burning with a stable flame and satisfactory combustion.

**Burner Tip:** The end of the transportation of natural gas from the wellhead, and the point of consumption.

**Butane (C<sub>4</sub>H<sub>10</sub>):** A hydrocarbon substance consisting of molecules composed of four atoms of carbon and ten atoms of hydrogen, used primarily for blending in high-octane gasoline, for residential and commercial heating, and for manufacturing chemicals and synthetic rubber.

**Butylene (C<sub>4</sub>H<sub>8</sub>):** A hydrocarbon substance consisting of molecules composed of four atoms of carbon and eight atoms of hydrogen, used primarily for blending in high-octane gasoline, for residential and commercial heating, and for manufacturing chemicals and synthetic rubber.

**Buy/Sell:** An arrangement whereby a party sells gas at the wellhead to a party with priority space in the pipeline queue, and then repurchases the gas downstream, paying transmission costs and any prearranged differentials.

**Bypass:** The action of a retail customer to obtain power or natural gas directly from a wholesale supplier or transporter, thus eliminating any utility charges applicable to distribution. This term is also sometimes applied when an end-user closes down operations, installs alternate fuel capability, or moves its operations to the service area of another natural gas supplier, thereby curtailing its purchases from its traditional supplier.



**CAAA90:** The Clean Air Act Amendments of 1990.

**Calorific Value:** See HEAT CONTENT.

**Calorimeter:** An apparatus for measuring the amount of heat released by the combustion of a compound or mixture.

**Capacity (Gas):** The maximum amount of natural gas that can be produced, transported, stored, distributed, or utilized in a given period of time under design conditions.

**Capacity, Peaking:** The capacity of facilities or equipment normally used to supply incremental gas or electricity under extreme demand conditions. Peaking capacity is generally available for a limited number of days at a maximum rate.

**Capacity, Pipeline:** The maximum throughput of natural gas over a specified period of time for which a pipeline system or portion thereof is designed or constructed, not limited by existing service conditions.

**Capacity Brokering:** The assignment of rights to receive firm gas transportation service.

**Capacity Charge:** One element of a two-part pricing method used in power transactions (energy charge is the other element). The Capacity Charge, sometimes called Demand Charge, is assessed on the amount of capacity being purchased or demanded. The Capacity Charge is typically expressed in \$/kW month (kilowatt-month).

**Capacity Release:** The assignment, allocation, or release of firm gas transportation rights to another party authorized under Order No. 636, done on a permanent or temporary basis, and awarded to the highest bidder.

**Capital Efficiency:** Measures of the return on capital we have expended or invested and is commonly measured by ROCE (Return on Capital Employed) or ROIC (Return on Invested Capital).

**Capital Velocity:** The rate at which capital is recycled to leverage the assets and skills of the enterprise more quickly without the need for a larger capital base.

**Captive (Core) Customer:** Buyer that can purchase natural gas from only one supplier, with no access to alternate fuel sources, usually describing a residential or small commercial user, but may apply to a large industrial and electric utility user as well.

**Carbon Black:** Almost pure amorphous carbon consisting of extremely fine particles, usually produced from gaseous or liquid hydrocarbons by controlled combustion with a restricted air supply or by thermal decomposition.

**Carbon Capture and Storage, or CCS:** The separation and capture of carbon dioxide (CO<sub>2</sub>) from industrial and power plant sources transport to a storage location and long-term isolation from the atmosphere.

**Carbon Cycle:** The natural processes that govern the exchange of carbon (in the form of CO<sub>2</sub>, carbonates and organic compounds, etc.) among the atmosphere, ocean and terrestrial systems. Major components include photosynthesis, respiration and decay between atmospheric and terrestrial systems.

**Carbon Dioxide, or CO<sub>2</sub>:** A naturally occurring gas, it is also produced by natural process such as respiration, decay of vegetation or forest fires, and as a by-product of human activities including use of fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the earth's temperature. It is the reference gas against which other GHGs are indexed and therefore has a "Global Warming Potential" (see entry) of 1.

**Carbon Dioxide Equivalent or CO<sub>2eq</sub> or CO<sub>2e</sub>:** An internationally accepted measure that expresses the amount of global warming of greenhouse gases (GHGs) in terms of the amount of carbon dioxide (CO<sub>2</sub>) that would have the same global warming potential. The Kyoto Protocol utilizes the 100-year Global Warming Potential to assess relative contributions GHGs on a mass-weighted basis.

**Carbon Market:** A popular term for a trading system through which countries may buy or sell units of greenhouse gas emissions in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union or the Northeast United States Regional Greenhouse Gas Initiative program. The term comes from the fact that carbon dioxide is the predominant greenhouse gas and other gases are measured in units called "carbon-dioxide equivalents."

**Carbon Sequestration:** The storage of carbon or carbon dioxide in the forests, soils, ocean, or underground in depleted oil and gas reservoirs, coal seams and saline aquifers. Examples include: the separation and storage of CO<sub>2</sub> from flue gases or the processing of fossil fuels to produce H<sub>2</sub>; and the direct removal of CO<sub>2</sub> from the atmosphere through land-use change, afforestation, reforestation, ocean fertilization, and agricultural practices to enhance soil carbon.

**Carbon Sinks:** Natural or man-made systems that absorb carbon dioxide from the atmosphere and store them. Trees, plants and the oceans all absorb CO<sub>2</sub> and, therefore, are carbon sinks.

**Carbon Tax:** A tax placed on carbon emissions. It is similar to a Btu tax, except that the tax rate is based on the fuel's carbon content.

**Carriage:** The transportation of a third party's natural gas by a pipeline as a separate service for a fee, as contrasted with the pipeline's transportation of its own system supply natural gas.

**Carrying Charge:** The costs of storing a physical commodity, including storage costs, insurance, interest and/or opportunity costs.

**Cash-Out:** Procedure in which shippers are allowed to resolve imbalances by cash payments, in contrast to making up imbalances with gas volumes in-kind.

**Casinghead Gas:** See GAS.

**Ceiling Price:** The maximum lawful price that could be charged for the first sale of a specified NGPA category of natural gas, pre-1993.

**Certificate of Public Convenience and Necessity:** Authorization to sell for resale or to transport natural gas in interstate commerce; or to construct, or acquire and operate, any facilities necessary therefore, subject to FERC jurisdiction under Section 7 of the NGA. May also refer to a similar permit issued by a state commission to a gas utility.

**Certified Emission Reductions (CER):** A Kyoto Protocol unit equal to 1 metric tonne of CO<sub>2</sub> equivalent. CERs are issued for emission reductions from CDM project activities. Two special types of CERs called temporary certified emission reduction (tCERs) and long-term certified emission reductions (lCERs) are issued for emission removals from afforestation and reforestation CDM projects.

**Check Meter:** See METER, GAS.

**City Gate (City Gate Station, Town Border Station):** Location at which natural gas ownership passes from one party to another, neither of which is the ultimate consumer; the point at which interstate and intrastate pipelines sell and deliver natural gas to local distribution companies.

**City Gate Rate (Gate Rate):** The rate charged a distribution utility by its suppliers. It refers to the cost of the natural gas at the point at which the distribution utility historically took title to the natural gas.

**Class of Service:** A group of customers with similar characteristics (e.g., residential, commercial, industrial, etc.) that are identified for the purpose of setting a rate for service.

**Clean Development Mechanism (CDM):** A mechanism under the Kyoto Protocol through which developed countries may finance greenhouse gas emission reduction or removal projects in developing countries, and receive credits for doing so which they may apply towards meeting mandatory limits on their own emissions.

**Coal Gasification:** A controlled process of reacting coal, steam, and oxygen under pressure and elevated temperature to produce coal gas. The gas created has a low heating value, but catalytic upgrading can be employed to produce high Btu pipeline-grade gas.

**Cogeneration:** (1) Any of several processes which either use waste heat produced by electricity generating to satisfy thermal needs or process waste heat to electricity or produce mechanical energy. (2) The use of a single prime fuel source in a reciprocating engine or gas turbine to generate both electrical and thermal energy to optimize fuel efficiency. The dominant demand for energy may be either electrical or thermal. Usually it is thermal with excess electrical energy, if any, being transmitted into the local power supply companies' lines.

**Cogenerator:** An entity owning a generation facility that produces electricity and another form of useful thermal energy (such as heat or steam), used for industrial, commercial, heating, or cooling purposes.

**Coincident Demand:** The sum of two or more demands that occur in the same time interval.

**Coincidental Peak Load:** The sum of two or more peak loads that occur in the same time interval.

**Combination Utility:** A utility supplier of both natural gas and some other utility service (electricity, water, transit, etc.).

**Combined Cycle:** Electricity generation where the waste heat of a gas turbine generator is used to heat water in a boiler to drive a steam-turbine generator, thereby increasing efficiency.

**Combined Cycle Unit:** An electric generating unit that consists of one or more combustion turbines and one or more boilers with a portion of the required energy input to the boiler(s) provided by the exhaust gas of the combustion turbine(s).

**Combustion Turbine (CT):** A fuel-fired turbine engine used to drive an electric generator. Combustion turbines, because of their generally rapid firing time, are used to meet short-term peak demands placed on power systems.

**Commercial:** A sector of customers or service defined as non-manufacturing business establishments, including hotels, motels, restaurants, wholesale businesses, retail stores, and health, social, and educational institutions. A utility may classify the commercial sector as all consumers whose demand or annual use exceeds some specified limit. The limit may be set by the utility based on the rate schedule of the utility.

**Commission:** (1) In the context of futures trading, the fee charged by a futures broker for executing an order. (2) The Federal Energy Regulatory Commission (3) State Public Utility's Commission(s).

**Committed Gas:** See SOURCE-SPECIFIC GAS SALES CONTRACT.

**Commodity Charge (or Rate):** A charge per unit of service actually delivered to the buyer. Compare DEMAND CHARGE.

**Commodity Costs:** Those costs that are allocated on the basis of actual use of service.

**Commodity Price Adjustment Clause:** A provision in a rate schedule for an adjustment of a customer's bill if the price of commodities or index of commodity prices varies from a specified standard.

**Common Carrier:** A facility obligated by law to provide service to all potential users without discrimination, with services to be prorated among users in the event capacity is not sufficient to meet all requests. Interstate oil pipelines are common carriers, but interstate natural gas pipelines are not.

**Comparability of Service:** Equal access to all natural gas pipeline transportation services, including storage and gathering, regardless of whether the customer purchases gas from the pipeline or from a third party. FERC Order No. 636 redefined comparability to require equality of service.

**Compressed Natural Gas:** See Gas.

**Compression:** The action on a material which decreases its volume as the pressure to which it is subjected increases. Natural gas is usually compressed for transport.

**Compression Ratio:** The relationship of absolute outlet pressure at a compressor to absolute inlet pressure.

**Compressor:** A mechanical device for increasing the pressure of a gas.

**Compressor Fuel:** Natural gas burned as fuel to operate a compressor.

**Compressor Station:** Facility that provides energy to move natural gas within a pipeline by increasing the pressure of the gas at the discharge side of the facility compared to the intake side.

**Condensate:** The liquid resulting when a vapor is subjected to cooling and/or pressure reduction.

**Condensate, Natural Gas:** Hydrocarbons, existing as vapor in natural gas reservoirs, that condense to liquids as their temperature and pressure decrease when natural gas is produced. Natural gas condensates consist mostly of pentanes (C<sub>5</sub>H<sub>12</sub>) and some heavier hydrocarbons. Once condensed, natural gas liquids are usually blended with crude oil for refining. Compare LIQUIDS, NATURAL GAS.

**Confirmed Nominations:** Pipeline verification that a change in a customer's level of transportation service will be matched by a change in supplier quantities.

**Conjunctive Billing:** The process of billing for several natural gas demands, services, or meters as if the billing were for a single demand, service, or meter. Conjunctive billing is sometimes referred to as Combined Billing.

**Construction Expenditures:** Cost of construction for additions to, renewals of, and replacements of plant facilities, including overhead and allowance for funds used during construction. Excludes the purchase cost of an acquired operating unit or system of utility plant, accounting transfers and adjustments to utility plant, and cost to remove plant facilities from service. Construction expenditures are capitalized in a utility's rate base.

**Construction Work In Progress (CWIP):** The account that includes the total of the balances of work orders for work in process of construction. This line item may or may not be included in the utility's rate base.

**Consumer:** The ultimate user of natural gas, as contrasted to a "customer" who may purchase natural gas for resale.

**Consumption (Fuel):** The amount of fuel used for gross generation, providing standby service, start-up and/or flame stabilization.

**Contained Helium:** See HELIUM.

**Contract Adjustment:** Under Order No. 636, the ability of customers to reduce, in whole or in part, their firm purchase and/or transportation obligations under contracts with their pipeline suppliers. Firm transportation, in contrast to firm sales, cannot be reduced unless the pipeline agrees or an alternative purchaser is found at the maximum price.

**Contract Carrier:** A facility that voluntarily provides its services to others on a private contractual basis.

**Contract Conversion:** Under FERC Order Nos. 500 and 636, the option of pipeline firm sales customers to convert their sales service entitlement to firm transportation service entitlement.

**Contract Demand:** The amount of service a seller agrees to provide on a periodic (daily, monthly, annually) basis. Contract demand is a maximum amount.

**Contract Term:** The term of effectiveness of a contract.

**Contracted Reserves:** Natural gas reserves dedicated to fulfill natural gas purchase agreements.

**Conversion to Natural Gas:** Changing consumer's energy service to natural gas from some other fuel. The term includes adjustment of consumers' appliances to perform satisfactorily with natural gas.

**Conversion Unit:** A unit consisting of a burner and associated thermostat and safety controls which can be used to convert heating equipment from one fuel to another.

**Core Customer:** See CAPTIVE CUSTOMER.

**Core Market:** Volumes that are typically supplied by the local distribution company to residential and commercial customers, public institutions such as hospitals and schools, and non-industrial companies with relatively small consumption and generally no alternative fuel capability.

**Correlative Rights:** The ownership rights of oil/gas producers within a common reservoir.

**Cost Allocation:** A procedure in which common or joint costs are apportioned among customers or classes of customers.

**Cost-Based Rate:** A rate based upon a projected cost of service and throughput level, contrasted with a market-based rate determined directly by supply and demand.

**Cost Classification:** In the context of FERC gas rate methodology, the classification of costs between demand and commodity components for purposes of pipeline rate design. Traditional cost classification methodologies include the following:

	Fixed Costs		Variable Costs	
	Demand	Commod.	Demand	Commod.
Seaboard	50%	50%	0%	100%
United	25%	75%	0%	100%
MFV <sup>1</sup>	60% <sup>2</sup>	40% <sup>3</sup>	0%	100%
SFV <sup>4</sup>	100%	0%	0%	100%

<sup>1</sup> Modified Fixed-Variable.

<sup>2</sup> Approximately; all fixed costs except return on equity and related taxes.

<sup>3</sup> Approximately; return on equity and related taxes.

<sup>4</sup> Straight Fixed-Variable.

**Cost of Capital:** The weighted average of the cost of various sources of capital, generally consisting of outstanding securities such as mortgage debt, preferred and preference stock, common stock, etc., and retained earnings.

**Cost of Service:** The total amount of money, including return on invested capital, operation and maintenance costs, administrative costs, taxes, and depreciation expense, to produce a utility service. Traditional utility cost of service may be expressed as Operating Costs + Taxes + (Rate of Return x {Cost of Plant - Depreciation}).

**Cost of Service Study:** A study designed to determine the cost of providing service to various classes of customers; used as a basis for establishing various electric and gas service rates. Factors that must be considered in rate design are the value of the service, the cost of competitive services, the volume and load factor of the system load equalization and stabilization of revenue, promotional factors and their relation to the social and economic growth of the service area, political factors such as the sizes of minimum bills, and regulatory factors.

**Cost of Service Tariff:** A tariff specifying that the entity providing the service will be reimbursed for its cost of service, including a specified rate of return on the rate base (distinguished from the usual tariff, providing for charges sufficient to cover the entity's costs of service and return on equity only if the entity meets its projected throughput).

**Costs, Administrative and General (A&G) Overhead:** A subset of operation and maintenance expenses that are part of a utility company's cost of service (e.g., salaries, office supplies and expenses, outside services, injuries and damages).

**Costs, Operation and Maintenance (O&M):** A broad class of expenses that are part of a utility company's cost of service (e.g., production, storage, terminaling, processing, transmission, distribution, customer accounts, customer service, sales, administration and general).

**Costs, Variable:** Costs that vary according to the amount purchased (e.g., gas acquisition costs).

**Credit Worthiness Review:** Process by which a pipeline evaluates a potential shipper's financial accountability.

**Cross-Subsidization:** The practice of charging rates higher than the actual cost of service to one class of customers in order to charge lower rates to another class of customers.

**Crude Helium:** See HELIUM, CRUDE.

**CT:** See Combustion Turbine.

**Cubic Foot:** The most common unit of measurement of gas volume; the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure, and water vapor.

**Curtaibility:** The right of a transmission provider to interrupt transmission when system reliability is threatened or emergency conditions exist.

**Curtaailable Rate:** An option offered by utilities to customers who can accept specified amounts of service reduction in return for reduced energy rates.

**Curtailement; Mandatory or Voluntary:** Reduction in scheduled capacity or energy delivery as a result of transmission constraints.

**Customer:** An individual, firm or organization that purchases service at one location under one rate classification, contract, or schedule. If service is supplied at more than one location or under more than one rate schedule, each location and rate schedule may be counted as a separate customer. See CLASS OF SERVICE.

**Customer Charge:** A fixed amount to be paid periodically by the customer without regard to demand or energy consumption. See also DEMAND CHARGE.

**Customer Costs:** The costs directly related to serving a customer, regardless of sales volume, such as meter reading, billing, and fixed charges for the minimum investment required to serve a customer.

**Customer Density:** Number of customers in a given unit of area or on a given length of distribution line.

**Cycling:** A storage process in which the same quantity of gas is injected into and withdrawn from storage within a prescribed time period. The maximum throughput of natural gas over a specified period of time for which a pipeline system or portion thereof is designed or constructed, not limited by existing service conditions.



**D1:** In the context of FERC gas rate design methodology, the demand charge component under the modified fixed-variable (MFV) rate design methodology that allocates fixed costs to firm sales customers based on peak usage or entitlement.

**D2:** In the context of FERC gas rate design methodology, the demand charge component under the modified fixed-variable (MFV) rate design methodology that allocates fixed costs to firm sales customers based on their projections of annual usages.

**Daily Average Send Out:** The total amount of natural gas delivered for a period of time divided by the number of days in the period.

**Daily Contract Quantity:** The maximum amount of natural gas per day that a buyer may purchase under the provisions of a gas purchase agreement.

**Data Request:** A request for information made by one party to another, typically in conjunction with a regulatory proceeding.

**Day Count:** The convention used for prorating an interest rate movement expressed on an annual basis to the percentage of the year represented by the settlement period. Most common are actual/360, actual/365, and 30/360.

**Debt Service:** The cost, actual or imputed, of borrowing money, ie., interest.

**Decontrol:** The act of ending federal government control over the wellhead price of new natural gas sold in interstate commerce.

**Deficiency Charge:** A charge per unit of deficiency imposed when a buyer's actual purchases fall below a required minimum or threshold level, as under a take-or-pay clause or certain forms of gas inventory charge.

**Deficiency Payment:** Generally a payment by a purchaser of natural gas to the seller after the purchaser has failed to take a contractually specified minimum amount of natural gas from the seller.

**Degree Day or Degree Day Deficiency:** A measure of the coldness of the weather experienced, based on the extent to which the daily mean temperature falls below a reference temperature, usually 65° F. For example, on a day when the mean outdoor dry-bulb temperature is 35° F, there would be 30 degree days experienced. A measure of seasonal variation and intensity of temperature. In residential customer load, the more degree days in a year than the "average," the higher the utility bill.

**Deliverability:** The amount of natural gas a well, field, pipeline, or distribution system can supply in a given period of time. Also, the practical output from a gas storage reservoir. See also DELIVERY CAPACITY.

**Delivery:** In the context of futures trading, the tendering and receipt of the physical commodity to satisfy a futures contract.

**Delivery Point:** The point on a gas pipeline's system at which it delivers natural gas that it has transported.

**Delivery Point Operator:** An operator responsible for balancing loads and allocating gas quantities received at delivery points to parties who have contracted to receive deliveries at the point.

**Depreciation:** The loss of value of assets, such as buildings and transmission lines, due to age and wear. Among the factors considered in determining depreciation are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the technology, changes in demand, requirements of public authorities, and salvage value. Depreciation is charged to utility customers as an annual expense.

**Demand:** The rate at which electric energy or natural gas is delivered to or by a system at a given instant or averaged over a designated period, usually expressed in kilowatts or megawatts (electric); Mcfs or MMBtus (natural gas).

**Demand Charge:** The Demand Charge portion of rate design is expected to recover the costs associated with the level of demand for the particular service and will be paid even if no service is taken by the customer; a reservation charge. Included in demand charges are capital-related costs and the cost of operation and maintenance of generation, transmission, and distribution.

**Demand Cost:** A cost included in the total cost of service that is allocated to classes of customers on the basis of service entitlements rather than actual use.

**Demand Day:** That 24-hour period specified by a supplier-user contract for purposes of determining the customer's daily amount of natural gas used (e.g., 7 am to 7 am). This term is primarily used in pipeline-distribution company agreements. It is similar to, and usually coincides with, the distribution company's "send-out day."

**Demand Determinant:** In pipeline rates, a factor established for each firm service customer that is applied against the pipeline's stated demand charge component to determine the customer's actual demand charge amount.

**Demand Forecast:** An estimate of the level of energy or capacity that is likely to be needed at some time in the future.

**Demand Interval:** Time period over which electric billing demand is measured (typically 15, 30, or 60 minute intervals).

**Deregulation:** The elimination of regulation from a previously regulated industry or sector of an industry.

**Design Day:** A 24-hour period of demand which is used as a basis for planning capacity requirements.

**Design Day Availability:** The amount of each type of service arranged to be available on design day, and the maximum combination of such services.

**Design Day Temperature:** The mean temperature assumed for a design day.

**Direct Billing:** A means of recovering costs other than by demand or commodity charge to customers; charges are made directly to identified parties, perhaps regardless of their current status as a customer. Direct billing provides a relatively low risk to the pipeline of non-recovery of costs.

**Direct Gas Sale:** A natural gas sales transaction in which at least one of the intermediary parties in the natural gas delivery system (i.e., pipeline transmission company or local distribution company) does not take title to the natural gas but only transports it. Historically, a sale of natural gas to an end-user, as opposed to a "sale for resale." More recently, the term has also been applied to a sale by a producer directly to an LDC.

**Disaggregation:** The breaking up of the traditional electric utility structure from a totally bundled service to an a la carte service. (See Divestiture and Functional Unbundling.)

**Dispatch:** The monitoring and regulation of an electrical or natural gas system to provide coordinated operation; the sequence in which generating resources are called upon to generate power to serve fluctuating loads.

**Displacement (Gas):** (a) In pipeline transportation, the substitution of a source of natural gas at one point for another source of natural gas at another point. Through displacement, natural gas can be transported by backhaul or exchange. (b) In natural gas marketing, the substitution of natural gas from one supplier of a customer with natural gas from another competing supplier.

**Distillate Fuel Oil:** A general classification for one of the petroleum fractions produced in conventional distillation operations. It is used primarily for space heating, on-and off-highway diesel engine fuel (including railroad engine fuel and fuel for agriculture machinery), and electric power generation. Included are Fuel Oils No. 1, No. 2, and No. 4; and Diesel Fuels No. 1, No. 2, and No. 4.

**Distributed Generation:** Electric power produced elsewhere than a central station generating unit, such as that using fuel cell technology or on-site small scale generating equipment.

**Distribution (Gas):** Mains, service connections, and equipment that carry or control the supply of natural gas from the point of local supply to and including the sales meters. See also PIPELINE SYSTEM.

**Distribution (Gas Utility) Company:** A company that obtains the major portion of its natural gas operating revenues from the operation of a retail gas distribution system and that operates no transmission system other than incidental connections within its own system or to the system of another company.

**Distribution Line:** Network-like pipeline that transports natural gas from a transmission line to an end-user's service line or to other distribution lines. Generally, large pipelines are laid in principal streets, with smaller lateral lines extending along side streets and connected at their ends to form a grid; sometimes lateral lines are brought to a dead end.

**Distribution Loss:** Natural gas lost through leakage or condensation in delivering natural gas to customers through distribution mains.

**Distribution System (High Pressure):** A system that operates at a pressure higher than the standard service pressure delivered to the customer; thus, a pressure regulator is required on each service to control pressure delivered to the customer.

**Distribution System (Low Pressure):** A system in which the pressure of the natural gas in the mains and service lines is substantially the same as that delivered to the customers' appliances; ordinarily a pressure regulator is not required on individual service lines in a low-pressure natural gas distribution system.

**Divestiture:** Corporate separation of generation, transmission and distribution of the traditional vertically integrated regulated utility as a means to eliminate market power.

**Docket:** A state or federal regulatory agency designation or classification of investigations or cases under consideration.

**DOE:** Department of Energy. A cabinet level department of the Executive Branch of the federal government.

**Downstream:** Commercial gas operations which are closer to the market, as opposed to upstream, which is closer to production.

**Downstream Pipeline:** A pipeline receiving natural gas from another pipeline at an interconnection point. Compare UPSTREAM PIPELINE.

**Dry-Bulb Temperature:** Technically, the temperature registered by the dry-bulb thermometer of a psychrometer. It is identical with the temperature of the air.



**Earnings Before Interest and Taxes (EBIT):** A measure of financial performance. EBIT consists of a company's revenues minus its cost of doing business. It is a measure of a company's operating profit before interest on debt and income taxes on earnings are deducted.

**Earnings Per Share (EPS):** The principal benchmark financial analysts use to judge a company's performance. EPS is calculated by dividing a company's net income by the average number of shares of common stock outstanding.

**Economic Dispatch:** The process of determining the desired generation level for each of the generating units in a system in order to meet customer demand at the lowest possible production cost given the operational constraints on the system.

**Economic Efficiency:** A term that refers to the optimal production and consumption of goods and services. This generally occurs when prices of products and services reflect their marginal costs.

**Economies of Scale:** Economies of scale exist where the industry exhibits decreasing average long run costs with size.

**Efficiency (E):** Relating to heat, a percentage indicating the available Btu input that is converted to useful purposes. It is applied, generally, to combustion equipment.

$$E = \frac{\text{Btu output}}{\text{Btu input}}$$

**EIA:** Energy Information Administration. An agency of the federal government which, among other things, is the chief federal statistical service for energy information.

**Elasticity of Demand:** The degree to which consumer demand for a product responds to changes in price, availability or other factors.

**Electronic Bulletin Board (EBB):** Generic name for the system of electronic posting of pipeline and electric transmission information as mandated by the FERC.

**Electronic Measurement:** Measurement of gas flow using electronic equipment that typically records data continuously and may transmit that data to a central operations location.

**Embedded Cost:** The historical cost of all facilities in the electric or gas supply system.

**Emission Reduction Unit (ERU):** A Kyoto Protocol unit equal to 1 metric tonne of CO<sub>2</sub> equivalent. ERUs are generated for emission reductions or emission removals from joint implementation projects.

**Emissions Trading:** A market-based approach to achieving environmental objectives that allows those reducing GHG emissions below what is required to use or trade the excess reductions to offset emissions at another source inside or outside the country. In general, trading can occur at the domestic, international and intra-company levels. For example, international emissions trading constitutes one of the Kyoto Mechanisms, designed to provide developing countries with a cost-effective flexibility for reducing emissions to achieve their agreed commitments.

**End-User:** One who actually consumes energy, as opposed to one who sells or re-sells it.

**Energy:** The capability of doing work (potential energy) or the conversion of this capability to motion (kinetic energy). Energy has several forms, some of which are easily convertible and can be changed to another form useful for work. Most of the world's convertible energy comes from fossil fuels that are burned to produce heat which is then used as a transfer medium to mechanical or other means in order to accomplish tasks.

**Energy Merchant:** An energy merchant buys and sells energy as a commodity. A merchant plant is one that is built with the aim of marketing and selling its output on the open market. This differs from building a plant to meet customer needs and the obligation to serve that a regulated utility has.

**Enhanced Oil Recovery (EOR):** The introduction of an artificial drive and displacement mechanism, usually steam, into a reservoir to produce oil unrecoverable by primary and secondary recovery methods.

**Energy Policy Act of 2005:** The Energy Policy Act of 2005 (EPAAct 2005) was the first comprehensive energy law enacted in more than a decade and made the most significant changes in the Federal Energy Regulatory Commission's (FERC or Commission) jurisdiction since the Federal Power Act and the Natural Gas Act of the New Deal era. EPAAct 2005: (1) affirmed a commitment to competition in wholesale power markets as national policy; (2) strengthened the Commission's regulatory tools, recognizing that effective regulation is necessary to protect the consumer from exploitation and assure fair competition; and (3) provided for development of a stronger energy infrastructure.

Through EPOA 2005, Congress granted the Commission significant new responsibilities and authority by amending the Federal Power Act, the Natural Gas Act, and the Public Utility Regulatory Policies Act of 1978. Of importance to the interstate natural gas pipeline industry, EPOA 2005 amended the Natural Gas Act to: (1) authorize specific procedures for the siting of liquefied natural gas terminals; (2) authorize market-based rates for natural gas storage services even when an applicant cannot demonstrate that it lacks market power; (3) include an express prohibition on market manipulation in connection with the purchase and sale of natural gas or transportation services; (4) designate the Commission as the lead agency for purposes of coordinating all applicable federal authorizations in connection with applications under section 3 and section 7 of the NGA; and (5) authorize judicial review in federal appellate courts in cases where a federal or state agency acting pursuant to federal law (other than the Coastal Zone Management Act) has denied or conditioned a permit required in connection with the Commission-approved facility.

**Enriching:** Increasing the heat content of natural gas by mixing it with a gas of higher Btu content (often propane).

**Entitlement, Working Interest:** A working interest owner's share of production from a well. This amount may not be equal to actual sales due to contractual or market conditions.

**EPA:** The Environmental Protection Agency. A federal agency charged with protecting the environment.

**Equity Capital:** The sum of capital from retained earnings and the issuance of stocks.

**Escalator Clause:** A clause in a purchase or sale contract that permits adjustment of the contract price under specified conditions.

**Essential Facilities:** A doctrine developed in anti-trust law which defines certain facilities, found necessary for transporting a product to market, as a potential monopoly and requires such facilities to be made available on a non-discriminatory basis.

**Ethane (C<sub>2</sub>H<sub>6</sub>):** A hydrocarbon molecule consisting of two carbon atoms and six hydrogen atoms, used as petrochemical feedstock in production of chemicals and plastics, and as a solvent in enhanced oil recovery processes.

**Ethylene (C<sub>2</sub>H<sub>4</sub>):** A hydrocarbon molecule consisting of two carbon atoms and four hydrogen atoms, used as petrochemical feedstock in production of chemicals and plastics, and as a solvent in enhanced oil recovery processes.

**Evergreen Clause:** A contract clause that extends the contract beyond the initial term, perhaps on a month-to-month or year-to-year basis, until one of the parties gives a required notice of termination.

**Exchange:** Transportation of natural gas by displacement over two pipelines, each of which takes and retains possession of gas contractually allocated to the other.

**Exchange Gas:** Natural gas that is received from, or delivered to, another party in exchange for natural gas delivered to, or received from that other party.

**Exit Fee:** A fee that is paid by a customer leaving the utility system intended to compensate the utility in whole or part for the loss of fixed cost: a contribution from the exiting customer.

**Extraction Loss:** The reduction in volume of wet natural gas due to the removal of natural gas liquids, hydrogen sulfide, carbon dioxide, water vapor and other impurities from the natural gas stream. Also called SHRINKAGE.



**Farm-Out:** An interest in an oil or gas lease which is granted to a third party by the lease holder.

**FASB:** Financial Accounting Standards Board.

**FASB71:** An exception to generally accepted accounting rules. In a regulated industry, if an asset that has been created by regulators and its associated costs have been established as recoverable from the ratepayers in the future, a company may record the asset on its books.

**Federal Energy Regulatory Commission (FERC):** A quasi-independent regulatory agency within the Department of Energy having jurisdiction over interstate electricity sales, wholesale electric rates, hydroelectric licensing, natural gas transmission and related services pricing, oil pipeline rates, and gas pipeline certification. With respect to the natural gas industry, the general regulatory principles of the FERC are defined in the Natural Gas Act (NGA), the Natural Gas Policy Act (NGPA), and the Natural Gas Wellhead Decontrol Act.

**Federal Power Act:** Enacted in 1920, and amended in 1935, the Act consists of three parts. The first part incorporated the Federal Water Power Act administered by the former Federal Power Commission, whose activities were confined almost entirely to licensing non-federal hydroelectric projects. Parts II and III were added with the passage of the Public Utility Regulatory Policies Act. These parts extended the Acts jurisdiction to include regulating the interstate transmission of electrical energy and rates for its sale as wholesale in interstate commerce. The Federal Energy Regulatory Commission is now charged with the administration of this law.

**Federal Power Commission (FPC):** The predecessor agency to the Federal Energy Regulatory Commission, which was created by an Act of Congress under the Federal Water Power Act on June 10, 1920. It was charged originally with regulating the electric power and natural gas industries. The FPC was abolished on September 20, 1977, when the Department of Energy was created. The functions of the FPC were divided between the Department of Energy and the Federal Energy Regulatory Commission.

**Feedstock:** Natural gas used as an essential component of a process for the production of a product (e.g., fertilizer, glass and white brick). Natural gas may be required as a feedstock due to the chemical reaction involved, or because of the physical burning characteristics of natural gas compared with other fuels, such as temperature and by-products.

**FERC:** The Federal Energy Regulatory Commission.

**FERC Gas Tariff:** A published statement filed by an interstate pipeline with the FERC that describes the rates, terms and conditions under which service will be provided. See also TARIFF.

**FERC-Out:** A clause in a contract which allows the pipeline to adjust the rates and terms to reflect regulatory action.

**Field:** A district or area from which natural gas is produced.

**Filed Rate Doctrine:** The Doctrine under the Natural Gas Act which requires rates to be on file with the Commission and which prevents increased rates from being imposed retroactively.

**Financial Assets:** Financial Assets are the record or the claim that facilitates an exchange of funds and a shift of risk.

**Firm Customer:** A customer for whom contract demand is reserved and to whom the supplier is obligated to provide service.

**Firm Demand:** The capacity that a supplier is required by contract to provide (except during extreme emergencies).

**Firm Gas:** Gas sold on a continuous basis for a defined contract term (e.g., one year).

**Firm Recallable Capacity:** Firm capacity which is released subject to the releasing shipper's right to recall, in accordance with specified criteria, such as cold weather, force majeure, loss of market, loss of gas, etc.

**Firm Service:** Service offered to customers under schedules or contracts that anticipate no interruptions, regardless of class of service, except for force majeure.

**Firm Transportation Service (FTS):** Transportation service offered to customers under schedules or contracts with a guaranteed availability unless prevented by act of force majeure. The contract holder may release temporarily or permanently its transportation capacity to other parties pursuant to the Commission's regulation governing capacity release. See 18 C.F.R. §284.8.

**First Sale:** A term adopted under the NGPA to describe certain sales of natural gas; ie., any sale of any volume of natural gas (i) to any interstate pipeline or intrastate pipeline; (ii) to any local distribution company; (iii) to any person for use by such person; (iv) which precedes any sale described in clauses (i), (ii), or (iii); and (v) any sale which precedes or follows any sale described in clauses (i), (ii), (iii), or (iv) and is defined by the FERC as a first sale in order to prevent circumvention of any maximum lawful price established under the NGPA. The NGPA excludes from the term "first sale" the sale of any volume of natural gas by any interstate or intrastate pipeline, local distribution company, or any affiliate thereof, unless such sale is attributable to volumes of natural gas produced by such affiliates thereof.

**Fixed Cost:** Cost associated with capital investment such as equipment, overhead, property taxes; any cost included in the cost of service that does not tend to fluctuate with the amount of energy produced.

**Fixed Operating Cost:** Cost, other than that associated with capital investment, that does not vary with the operation, such as base maintenance and labor.

**Fixed Price:** A contract in which a named, exact price is specified for commodities. A fixed price contract usually has variations to the fixed price such as escalators or redeterminations for increased costs or incentives for meeting various goals.

**Fixed Price Tariff:** A standard energy charge that remains fixed for a specified period of time except for adjustments to reflect changes in fuel costs.

**Flaring:** The act, illegal in the United States, of burning gas that could not be sold at the field site.

**Flex Rates:** Monthly price adjustments in pipeline rates, within a minimum and maximum cap.

**Floor:** A rate option strategy that allows its holder to set a floor, or minimum interest rate, for his floating rate deposits over a period of time. A floor is analogous to a series of put options on interest rates protecting the buyer from interest rates falling below a specific level.

**Force Majeure:** A common law concept borrowed from the French civil law. "Force majeure" means superior or irresistible force that excuses a failure to perform. It has been defined by the United States Supreme Court as a cause that is "beyond the control and without the fault or negligence" of the party excused. Force majeure events also must not have been reasonably foreseeable; e.g., a blizzard in Houston in January may be a force majeure event, but a blizzard in Montana will not qualify.

**Forward Buying:** Providing commodities (such as power) for future needs assuring that it will be on hand when needed and that there will be no disruption of service.

**Forward Contract:** A commitment to buy (long) or sell (short) an underlying asset at a specified date at a price (known as the exercise or forward price) specified at the origination of the contract.

**Forward Curve:** A Forward Curve is the sequence of future yields corresponding to the floating reference rates on a swap.

**Forward Price:** Forward Price is the future yield of an instrument that will determine the Forward Curve.

**Forward Rate Agreement (FRA):** A transaction in which two counterparties agree to a single exchange of cash flows based on a fixed and a floating rate respectively. A Forward Rate Agreement can be viewed as a one-date interest rate swap.

**Fossil Fuel:** Fuel such as coal, crude oil or natural gas, formed from the fossil remains of organic material.

**FPA:** Federal Power Act.

**FPC:** Federal Power Commission.

**Fractionation:** The process of separating liquid hydrocarbons from natural gas into propane, butane, ethane, etc.

**Franchise:** A special privilege conferred by a government on an individual or corporation to occupy and use the public ways and streets for benefit to the public at large. Local distribution companies typically have exclusive franchises for utility service granted by state or local governments.

**Fuel:** Any substance that can be burned to produce heat; also, materials that can be fissioned in a chain reaction to produce heat.

**Fuel-Switching:** Substituting one fuel for another based on price and availability. Large industries often have the capability of using either oil or natural gas to fuel their operation and of making the switch on short notice.

**Fuel-Switching Capability:** The ability of an end-user to readily change fuel type consumed whenever a price or supply advantage develops for an alternative fuel.

**Fuel Use Act:** A statute enacted in 1978. It limited the use of natural gas in power plant and industrial boilers and that portion of the Act was repealed in 1987.

**Fugitive Emissions:** Releases not confined to a stack, duct or vent. These emissions generally include equipment leaks, emissions from the bulk handling or processing of raw materials, windblown dust and a number of other specific industrial processes. In the natural gas pipeline industry, these emissions are methane leaks from pipelines and system components such as compressor seals, pump seals, valve packings, and flanges and piping connectors. Fugitive emissions are unintended anthropogenic releases of gases (air pollutants), such as carbon dioxide, from the processing, transmission, and/or transportation of fossil fuels.

**Futures:** A standardized contract for the purchase or sale of a commodity which is traded for delivery in the future.

**Futures Contract:** An exchange-traded contract promising to buy or sell standard commodities or securities at a future date at a set price. Futures are “paper” deals and involve profit and loss on promises to deliver, not possession of the actual commodity. The main difference between a futures contract and a forward contract is that a futures contract is cash settled, or marked-to-market, daily. Additionally, the futures market requires that all market participants - sellers and buyers alike - post a performance bond call margin.



**Gas:** That state of matter which has neither independent shape nor volume. Gas expands to fill the entire container in which it is held. Gas is one of the three forms of matter: solid, liquid and gas.

*Associated* - Free natural gas in immediate contact, but not in solution, with crude oil in the reservoir. Also called “gas cap gas.”

*Casinghead* - Unprocessed natural gas produced from a reservoir containing oil; natural gas produced with oil from oil wells. Sometimes called “Braden head gas,” “oil well gas,” “wet gas,” or “solution gas.”

*Coal* - Manufactured gas made by distillation or carbonization of coal in a closed coal gas retort, coke oven, or other vessel.

*Coal Bed* - Gas found in or released from coal deposits.

*Company-Used* - Natural gas consumed by a gas distribution or gas transmission company or the gas department of a combination utility, e.g., fuel for compressor stations, etc.

*Compressed Natural* - Gas used in vehicles and in other applications not related to a pipeline.

*Conventional* - Gas produced under present-day technology at a cost not greater than the current market value.

*Cushion* - The natural gas required in a gas storage reservoir to maintain a pressure sufficient to permit recovery of stored gas. Also called BASE GAS.

*Deep* - Natural gas found at depths greater than the average for a particular area; for NGPA purposes deep gas was natural gas found at depths of more than 15,000 feet, and was not price-regulated.

*Deregulated* - Natural gas no longer subject to sales and/or price regulation, pursuant to the NGA, NGPA and NGWDA.

*Dissolved* - Natural gas in solution in crude oil in the reservoir.

*Dry* - Natural gas whose water content has been reduced by a dehydration process. Also natural gas containing little or no hydrocarbons commercially recoverable as liquid product.

*Fuel or Fuel Use* - Natural gas used by a pipeline as fuel for its compressors to operate its system (Typically retained by the pipeline to meet this operating requirement).

*Liquefied Natural (LNG)* - Natural gas that has been super cooled under pressure to -259° F. It remains a liquid at -116° F and 673 psia. LNG occupies 1/600 of the space occupied in the vapor state at standard conditions and is almost pure methane.

*Liquefied (or Liquid) Petroleum (LPG)* - Hydrocarbons that are gases at normal temperatures and pressures but that readily turn into liquids under moderate pressure at normal temperatures; e.g., propane and butane.

*Marketable (Merchantable)* - Raw natural gas from which impurities have been removed so that the natural gas meets the quality specifications of the pipeline transmission facility that will receive it for transportation to market. Also called PIPELINE QUALITY GAS.

**Must-Take** - Natural gas supplies committed to a purchaser under terms such as drainage protection or reservoir protection clauses or other provisions that absolutely obligate a purchaser to take natural gas from a supplier.

**Native** - Natural gas in place in a producing reservoir when the reservoir is converted into a natural gas storage reservoir.

**Natural** - A naturally occurring mixture of hydrocarbon and nonhydrocarbon gases (mainly methane, CH<sub>4</sub>) found in porous geologic formations beneath the earth's surface, often in association with petroleum.

**Non-Associated** - Free natural gas not in contact with, or dissolved in, crude oil in the reservoir.

**Oil** - A gas resulting from the thermal decomposition of petroleum oils, composed mainly of volatile hydrocarbons and hydrogen.

**Pipeline Quality** - See GAS, MARKETABLE, and GAS, RESIDUE.

**Raw** - Unprocessed or partially processed natural gas. See also GAS, WET.

**Regulated** - Natural gas subject to sales and/or price regulation pursuant to the NGPA.

**Residue** - That portion of the natural gas stream which remains after the extraction of ethane and heavier liquid and liquefiable hydrocarbons, impurities and less fuel, incidental losses, bypassed natural gas, and natural gas reserved by a seller under a gas purchase agreement.

**Shut-In** - Natural gas that could be produced, but the production of which is curtailed due to state conservation orders (pro-rationing), unfavorable economics, lack of buyers at existing prices, failure of committed buyers to take natural gas, or other reasons that result in natural gas not being produced.

**Solution** - See GAS, CASINGHEAD.

**Sour** - Natural gas which in its natural state contains such amounts of compounds of sulfur as to make it impractical to use, without purifying, because of the corrosive effect of the sulfur compounds on piping and equipment.

**Sweet** - Natural gas which in its natural state contains such small amounts of compounds of sulfur that it can be transported or used without purifying, with no deleterious effect on piping and equipment.

**Synthetic** - Natural Methane obtained from sources other than naturally occurring reservoirs of natural gas, such as by heating coal, refining heavier hydrocarbons, or processing garbage or other organic materials. Gases other than natural gas or liquid or solid hydrocarbons converted to a gaseous fuel of heat content, compatibility and quality equivalent in performance to that of natural gas.

**Tight Sands** - Natural gas contained in rock with low permeability, requiring enhanced and expensive production techniques. Under the NGPA, natural gas from designated tight sands formations qualified for incentive sales prices.

**Unaccounted-For** - The difference between the amount of natural gas delivered to a pipeline for transportation and that redelivered by the pipeline, taking into account fuel, plant shrinkage, and imbalances. Differences include leakage or other actual losses, discrepancies due to meter inaccuracies, variations of temperature and/or pressure, and other variants, particularly billing lag. Pipelines typically levy a charge of a portion of each shipper's natural gas to cover losses.

*Unconventional* - Natural gas which must be produced by means other than current technologies.

*Vehicular Natural (VNG)* - Natural gas used as fuel to power passenger and freight vehicles.

*Wet* - Unprocessed natural gas or partially processed natural gas, produced from strata containing condensable hydrocarbons and liquid hydrocarbons in solution.

**Gas-Flow:** A set of standard record formats supporting the electronic data interchange of files, established by a joint Task Force of the Interstate Natural Gas Association of America (INGAA), the Council of Petroleum Accountants Society (COPAS), and the American Gas Association (AGA).

**Gas-Reserves:** Natural gas in natural underground formation in wells, fields or pools.

**Gas Transported for Others:** Natural gas owned by another company received into and transported through any part of a pipeline transmission system under a transportation agreement.

**Gasification:** Any of various processes by which coal is turned into natural gas.

**Gas Turbine Plant:** A plant in which the prime mover is a gas turbine. A gas turbine typically consists of an axial-flow compressor which feeds compressed air into one or more combustion chambers where liquid or gaseous fuel is burned. The resulting hot gases are expanded through the turbine, causing it to rotate. The rotating turbine shaft drives the compressors as well as the generator, producing electricity.

**Gathering Line:** Network-like pipeline that transports natural gas from individual wellheads to a compressor station, treating or processing plant, or main trunk transmission line. Gathering lines are generally relatively short in length, operate at a relatively low pressure, and are small in diameter.

**Gathering Station:** A compressor station at which natural gas is gathered from wells by suction because wellhead pressure is not sufficient to produce the desired rate of flow into a transmission or distribution system.

**Global Warming Potential (GWP):** The standard used to compare the abilities of different greenhouse gases to trap heat in the atmosphere. GWPs are based on the radiative efficiency (heat-absorbing ability) of each gas relative to that of carbon dioxide (CO<sub>2</sub>), as well as the decay rate of each gas (the amount removed from the atmosphere over a given number of years) relative to that of CO<sub>2</sub>. The GWP provides a construct for converting emissions of various gases into a common measure, which allows climate analysts to aggregate the radiative impacts of various greenhouse gases into a uniform measure denominated in carbon or carbon dioxide equivalents.

**Grade Gas Revenue Accounting Data Exchange:** A system for the electronic communication of natural gas production and sales data between companies in the energy industry.

**Graduated Rate:** See INVERTED RATE STRUCTURE (GRADUATED RATE).

**Grandfather Clause:** A clause in a contract which maintains the prior rule or policy where a new rule or policy would otherwise be applicable.

**Greenhouse Gases (GHGs):** The atmospheric gases attributed to global warming. The major GHGs are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O). Less prevalent - but very powerful - greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>).

**Greenhouse Effect:** The increasing mean global surface temperature of the earth believed to be caused by gases in the atmosphere (including carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbon). The greenhouse effect allows solar radiation to penetrate but absorbs the infrared radiation returning to space.

# H

**Headstation:** Mainline receipt point on a pipeline.

**Heat or Heating Rate:** The measure of efficiency in converting input fuel to electricity. Heat rate is expressed as the number of Btu's of fuel (e.g., natural gas) per kilowatt hour (Btu/kWh). Heat rate for power plants depends on the individual plant design, its operating conditions, and its level of electric power output. The lower the heat rate, the more efficient the plant.

**Heat Content:** The sum of the latent heat and sensible heat contained in a substance, above the heat contained at a specified temperature and pressure; expressed as Btu or calories per unit of volume or weight. Also CALORIFIC VALUE.

**Heating Value:** The amount of heat produced by the complete combustion of a unit quantity of fuel. The gross, or higher, heating value is that which is obtained when all of the products of combustion are cooled to the temperature existing before combustion, the water vapor formed during combustion is condensed, and all the necessary corrections have been made. The net, or lower, heating value is obtained by subtracting the latent heat of vaporization of the water vapor formed by the combustion of the hydrogen in the fuel from the gross, or higher, heating value.

**Hedging:** To offset a position with the intent of managing risk. The process of protecting the value of an investment from the risk of loss in case the price fluctuates. Hedging is accomplished by protecting one transaction with another. A long position in an underlying instrument can be hedged or protected with an offsetting short position in a related underlying instrument.

**Helium (HE):** A light, colorless, nonflammable gaseous element found especially in conjunction with natural gas and used mainly in cryogenic applications, medical technology, military uses, and welding.

**Herfindahl-Hirschman Index (HHI):** A formula for defining market concentration by summing the squares of the individual market shares of all participants.

**Hinshaw Pipeline:** A pipeline company (defined by the Natural Gas Act and exempted from FERC jurisdiction under the NGA) defined as a regulated company engaged in transportation in interstate commerce, or the sale in interstate commerce for resale, of natural gas received by that company from another person within or at the boundary of a state, if all the natural gas so received is ultimately consumed within such state. A Hinshaw pipeline may receive a certificate authorizing it to transport natural gas out of the state in which it is located, without giving up its status as a Hinshaw pipeline.

**Historic Sales Customers:** A pipeline's traditional customers who purchased bundled sales service from the pipeline prior to Order No. 636.

**“Hot Air”:** Refers to the concern that some governments will be able to meet their targets for greenhouse gas emissions under the Kyoto Protocol with minimal effort and could then flood the market with emissions credits, reducing the incentive for other countries to cut their own domestic emissions.

**Hub:** An interchange where multiple pipelines interconnect and form a market center.

**Hub Services:** Hub services are provided at an interchange where pipelines interconnect and form a market center. Such services include parking, loaning, supply pooling and storage.

**Hydrocarbon:** Organic compound made up of carbon and hydrogen atoms. Heavier fossil fuels, such as coal, have a large ratio of carbon to hydrogen, while natural gas (methane) is the lightest hydrocarbon, with

one atom of carbon and four atoms of hydrogen (CH<sub>4</sub>). Natural gas liquids are heavier than methane but lighter than crude oil. Crude oil is a complex of many hydrocarbons.



**Imbalance, Gas:** A discrepancy between a transporter's receipts and deliveries of natural gas for a shipper. Most pipelines require that a shipper's deliveries to the pipeline and receipts from the pipeline remain in balance over a given period of time or the pipeline may assess charges until the imbalance is cured.

**Imbalance Penalties:** Penalties implemented by a pipeline to provide an incentive for shippers to maintain actual receipts and deliveries at nominated and confirmed levels.

**Impairment or Asset Impairment:** Impairment or asset impairment occurs when, due to changed circumstances, the previously allowed recovery of costs of a regulatory asset through rates is eliminated or removed by action of a regulatory body.

**Imprudence:** In the context of FERC rate methodology, a determination that certain of a pipeline's costs have not been prudently incurred, with the result that the pipeline is prohibited from placing such costs in its rates. See PRUDENT INVESTMENT.

**Imputed:** In the context of FERC rate methodology, an arbitrarily attributed, rather than actual value.

**Integrity Management Program (IMP):** The Department of Transportation's Pipeline Hazardous Materials and Safety Administration (PHMSA), under the Gas Transmission IM Rule (49 C.F.R. Part 192, Subpart O) requires gas transportation pipeline operators to develop a written Integrity Management Program. The Gas Transmission IM Rule took effect in February 2004. An operator's IMP must identify High Consequence Areas (HCAs) on its system and threats to each covered segment (by the use of data integration and risk assessment), perform baseline integrity assessments of each pipeline segment, and inspect the entire pipeline system according to a prescribed schedule and using prescribed methods, provide for remediating conditions found during integrity assessments and, in addition to other requirements, provide a process for continual evaluation and assessment. Reassessment intervals are mandated.

**Intergovernmental Panel on Climate Change (IPCC):** Established in 1988 by the World Meteorological Organization and the UN Environment Programme, the IPCC surveys world-wide scientific and technical literature and publishes assessment reports that are widely recognized as the most credible existing sources of information on climate change. The IPCC also works on methodologies and responds to specific requests from the UNFCCC subsidiary bodies. The IPCC is independent of the UNFCCC.

**Interruptible Transportation Service (IT):** Transportation service offered to customers under schedules or contracts on an as-available basis. This service can be interrupted on a short notice for a specified number of days or hours during times of peak demand or in the event of system emergencies. In exchange for interruptible service, customers pay lower prices.

**Incentive Rates:** Rates which permit increased profits as a reward for increases in cost savings and efficiencies.

**Incremental Cost:** The change in total costs when output is increased or decreased by an increment or block of output for which costs can be accurately determined, usually calculated as the change in cost divided by the change in volume (for example as cents per Mcf); marginal cost.

**Incremental Energy Cost:** Cost incurred by producing or purchasing next available unit of energy (gas,

electricity, oil, coal, etc.).

**Indefinite Price Escalator:** Contract provision that allows for future price adjustments that cannot be determined when the contract is executed; e.g., area rate clause, most favored nations clause.

**Index:** A measure of relative value attached to a specific commodity or group of commodities or stocks. An index option is an option contract based on an index instead of an individual stock or commodity. A measure of market trends.

**Indexing:** Tying the commodity price of gas in a contract to published prices.

**Industrial Bypass:** A situation in which large industrial customers buy power directly from a non-utility generator, bypassing the local utility system. Deregulation of generation and transmission in some instances has opened up the opportunity for large electricity users to purchase services from a supplier other than the local retail utility.

**Industrial Customer:** The industrial customer is generally defined as manufacturing, construction, mining, agriculture, fishing and forestry establishments, Standard Industrial Classification (SIC) codes 01-39. The utility may classify industrial service using the SIC codes, or based on demand or annual usage exceeding some specified limit. The limit may be set by the utility based on the rate schedule of the utility.

**Infill Drilling:** Drilling between existing well locations for the purpose of increasing reserves or productive capacity.

**Injected Gas:** Natural gas placed in underground storage or returned to the producing reservoir to maintain pressure.

**Instantaneous Service:** The ability to change deliveries on a pipeline simultaneously with a change in nominations on the same business day.

**Integrated Gas Company:** A company that obtains significant portions of its natural gas revenues from the operations of both a retail natural gas distribution system and a natural gas transmission system.

**Interruptible Demand (Customer):** The magnitude of customer demand that, in accordance with contractual arrangements, can be interrupted by direct control of the system operator, remote tripping, or by action of the customer at the direct request of the system operator.

**Interruptible Gas:** Gas sold to customers with a provision that permits curtailment or cessation of service at the discretion of the supplier under certain circumstances, as specified in the service contract.

**Interstate Market:** The market for natural gas that is consumed outside the state in which it is produced or is transported by an interstate pipeline pursuant to NGA authorization, or both. Gas sold to an interstate pipeline is sold in the interstate market.

**Interstate Pipeline:** A natural gas pipeline company that is engaged in the transportation of natural gas across state boundaries, and is therefore subject to FERC jurisdiction and/or FERC regulation under the NGA.

**Intraday Nominations:** An intraday nomination is a request for transportation of natural gas on an interstate natural gas pipeline that is submitted after the initial daily nomination deadline whose effective time is no earlier than the beginning of the gas day and runs through the end of the same gas day.

**Intrastate Market:** The market for natural gas consumed in the same state as it is produced, without the natural gas having been transported by an interstate pipeline.

**Intrastate Pipeline:** A natural gas pipeline company that is engaged in the transportation of natural gas not subject to the FERC jurisdiction under the NGA.

## J

**Joint Implementation (JI):** A mechanism under the Kyoto Protocol through which a developed country can receive “emissions reduction units” when it helps to finance projects that reduce net greenhouse gas emissions in another developed country.

**Jurisdictional Agency:** The state or federal agency having regulatory jurisdiction over the production, transportation, or sale of natural gas.

**Jurisdictional Sale:** A natural gas sale subject to the jurisdiction of the FPC or its successor, the FERC.

**Just and Reasonable Rate:** A rate for natural gas supply or transportation service subject to the NGA or the NGPA. “Just and reasonable” has been defined generally to mean a rate that is based on the properly allocated cost of providing service.

## K

**Kyoto Protocol:** The Protocol, drafted during the Berlin Mandate process, that requires countries listed in its Annex B (developed nations) to meet differentiated reduction targets for their emissions of covered greenhouse gases relative to 1990 levels by 2008–12. It was adopted by all Parties to the UNFCCC in Kyoto, Japan, in December 1997, and entered into force on February 16, 2005.

**Kyoto Mechanisms:** Three procedures established under the Kyoto Protocol to increase the flexibility and reduce the costs of making greenhouse gas emissions cuts; they are the Clean Development Mechanism, Emissions Trading and Joint Implementation.

## L

**Lateral:** A pipe that branches away from the central and primary part of the system.

**Leakage:** That portion of cuts in greenhouse gas emissions by developed countries - countries trying to meet mandatory limits under the Kyoto Protocol - that may reappear in other countries not bound by such limits. For example, multinational corporations may shift factories from developed countries to developing countries to escape restrictions on emissions.

**Lease:** Any instrument that gives a producer the right to drill for, produce, and dispose of oil and natural gas in, under, and from the lands described therein.

**Leverage Ratio:** The ratio of total debt to total assets; i.e. a measure that indicates the financial ability to meet debt service requirements.

**Liability:** An amount payable in dollars or by future services to be rendered.

**Light-Handed Regulation:** Regulatory approval of rate levels resulting from arm's length negotiations, rather than calculated on a cost of service basis, and subject to challenge only under a complaint proceeding.

**Line Loss:** The reduction in the quantity of natural gas flowing through a pipeline that results from leaks, venting, and other physical and operational circumstances on a pipeline system.

**Line Pack and Draft:** Packing the line increases the amount of gas in the system by adding gas and/or increasing pressure and drafting the line decreases the amount of gas in the system by decreasing gas and/or decreasing pressure.

**Liquidation:** The closing of futures positions.

**Liquidity:** A high level of trading activity.

**Liquids, Natural Gas:** Those liquid hydrocarbon mixtures that are gases at reservoir temperatures and pressures, but can be recovered by condensation or absorption. Natural gasoline and liquefied petroleum gases fall in this category.

**Load Density:** The concentration of natural gas load for a given area expressed as an amount of natural gas per unit of time and per unit of area.

**Load Factor:** The ratio of average load to peak load during a specific period of time, expressed as a percent. The load factor indicates to what degree energy has been consumed compared to maximum demand or the utilization of units relative to total system capability. An electric system's load factor shows the variability in all customers' demands.

**Load Management:** The management of load patterns in order to better utilize the facilities of the system. Generally, load management attempts to shift load from peak use periods to other periods of the day or year.

**Load Valley:** A period of reduced load, as contrasted with peak load.

**Loaning:** Loaning is a service that allows a customer to borrow gas (loan) from the pipeline for transport by the customer under its firm or interruptive transportation agreement. The customer will return the gas quantities at a later date. Loaning also is referred to as advancing, drafting, reverse parking, and imbalance resolution.

**Local Distribution Company (LDC):** A company that obtains the major portion of its revenues from the operations of a retail distribution system for the delivery of electricity or gas for ultimate consumption.

**Long Run Marginal Costs:** All costs associated with the lowest cost incremental unit including variable production costs, fixed O&M, and capital costs.

**Lookback Option:** An option that allows the buyer the right, retroactively, to buy (sell) the underlying commodity or security at its minimum (maximum) price within the lookback period.

**Looping:** Laying additional pipeline beside and connected to an existing pipeline in order to increase the capacity of the system.

**LP Gas-Air Mixture:** Mixture of liquefied petroleum gas and air to obtain a desired Btu value, capable of being distributed through a distribution system; also used for standby and peak shaving by natural gas utilities.



**Main Extension:** The addition of pipe to an existing gas main to serve new customers.

**Mainline:** See PIPELINE SYSTEM, TRANSMISSION LINE.

**Main, Gas:** Pipe used to carry natural gas from one point to another. As contrasted with service gas pipes, mains usually carry natural gas in large volume for general or collective use. See PIPELINE SYSTEM.

**Marginal Cost:** The increase or decrease in total costs brought about by a one unit increase or decrease in output.

**Marginal Cost Pricing:** A system of pricing designed to ignore all costs except those associated with producing the next increment of production. Sometimes referred to as incremental cost pricing.

**Market-Based Sales Rates:** Sales rates resulting from arm's length negotiations, rather than the pipeline's or its affiliate's actual costs of supplies.

**Market Center:** See HUB.

**Market-Clearing Level:** The maximum price at which all of an available commodity (natural gas or electricity) can be sold in a specified market.

**Marketable Gas:** See GAS, MARKETABLE.

**Marketer:** An entity engaged in bringing together sellers and buyers, usually on a spot-market basis, assisting in negotiations, and arranging transportation and delivery terms.

**Marketing Affiliate:** Marketer owned or substantially controlled by an affiliate gas pipeline or electric utility.

**Market-Out:** A provision in an energy sales agreement that allows one or both parties to demand re-negotiation of the sales price and/or terminate the contract if the contract sales price no longer reasonably reflects the current market.

**Market Price:** The current price of an underlying instrument in the marketplace.

**Master Metering:** Separate metering of individual units in a new building is required if the occupant has control over energy use in the unit and if its benefits exceed cost.

**Maximum Demand:** The greatest of all demands of the load that has occurred within a specified period of time.

**Mcf:** One thousand cubic feet of natural gas.

**Mean Temperature:** As used by the Weather Bureau in determining degree days, the average of the maximum and the minimum dry-bulb atmospheric temperatures in degrees Fahrenheit recorded for each day.

**Meter, Gas:** An instrument for measuring and indicating, or recording, the volume of natural gas that has passed through it.

**Meter, Diaphragm:** A gas meter in which gas passes through two or more chambers and moves diaphragms geared to a volume-indicating dial.

**Meter, Five Light:** A small size diaphragm meter, usually installed for a domestic consumer. The standard capacity is approximately 150 cubic feet per hour. Recently, a three light meter has also come into frequent use.

**Meter, Orifice:** A meter for measuring flow of fluid through a pipe or duct by measurement of the pressure differential across a plate that has a precisely cut hole in its center.

**Meter, Rotary Displacement:** A positive-pressure blower used as a meter in which gas pressure turns the blower and the volume of gas passing through is proportionate to the number of revolutions.

**Meter, Venturi:** A fluid-flow meter in which the fluid flow is determined by measuring the pressure drop caused by the flow of the fluid through a Venturi throat or tube. The pressure drop across the tube is proportionate to the fluid-flow rate.

**Metering:** Use of devices that measure and register the amount and/or direction of energy quantities relative to time.

**Methane (CH<sub>4</sub>):** The lightest in the paraffin series of hydrocarbons. It is colorless, odorless and flammable; the major portion of marsh gas and natural gas.

**Minimum Charge (Minimum Bill Clause):** A clause in a contract that provides that the charge for a prescribed period shall not be less than a specified amount.

**Minimum Commodity Bill:** A charge that requires the purchaser to pay up to the full charge for a specified percentage of contracted amounts whether or not the specified amount of service is actually taken.

**Mitigation:** In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other “sinks” to remove greater amounts of carbon dioxide from the atmosphere.

**MMBtu:** One million British thermal units.

**MMcf:** One million cubic feet of natural gas.

**Modified Fixed-Variable Rate Design:** A rate-design methodology employed by the FERC for interstate natural gas pipelines that allocates all fixed costs except return on equity and related taxes to the demand charge, and that allocates return on equity and related taxes, all production and gathering costs, and all variable costs to the commodity charge.

**Monopoly:** A state of exclusive or near-exclusive ownership or control of a commodity, service or facility through legal privilege, command of supply, or concerted action, making possible the manipulation of prices.

**Monopsony:** In contrast to monopoly, monopsony is a market condition in which there are a large number of sellers and only one buyer.

**Most Favored Nation Clause:** A contract clause that ties the contract price to the rates paid in other contracts, usually specifying the region to be taken into consideration, such as a county, state, field, basin, or other geographic or geologic area. Generally, most favored nation clauses require that the other contracts be recent in time and for like quantity, quality and contract term.

**Municipal Utility:** A utility owned and operated by a municipality or group of municipalities.



**NASUCA:** The National Association of Utility Consumer Advocates. NASUCA includes members from 38 states and the District of Columbia. It was formed “to exchange information and take positions on issues affecting utility rates before federal agencies, Congress and the courts.”

**National Association of Regulatory Utility Commissioners (NARUC):** A professional trade association, headquartered in Washington, D.C., composed of members of state and federal regulatory bodies that have regulatory authority over public utilities.

**National Environmental Policy Act of 1969 (NEPA):** A law requiring agencies to consider the environmental impacts of major federal actions and to prepare environmental impact statements (EISs) which discuss these impacts and weigh alternatives. The law also requires public participation in the EIS process.

**Natural Gas:** A naturally occurring mixture of hydrocarbon and non-hydrocarbon gases found in porous geological formations beneath the earth’s surface, often in association with petroleum. The principal constituent is methane, CH<sub>4</sub>.

**Natural Gas Act of 1938 (NGA):** A federal statute enacted in 1938 to provide regulatory control over the interstate sale and transportation of natural gas. Under the NGA, the Federal Power Commission was given two major powers: (1) the power to issue certificates of public convenience and necessity authorizing construction and operation of facilities and the provision of services, and (2) the power to regulate rates for (a) sales in interstate commerce of natural gas sold for resale for ultimate public consumption and (b) transportation of natural gas in interstate commerce. The Act specifically provides that the NGA will not apply to other sale or transportation of natural gas or to the local distribution of natural gas, or to the facilities used for such distribution, or to the production or gathering of natural gas.

**Natural Gas Policy Act of 1978 (NGPA):** A federal statute enacted in 1978 to phase out producer rate regulation between January 1, 1985 and July 1, 1987. The NGPA provides “maximum lawful prices” for those categories of natural gas that it subjects to price regulation. The NGPA also provides for “self-implementing” transportation services, without the need for prior certificates of public convenience and necessity from the FERC under the NGA, for certain qualifying transportation by interstate pipelines on behalf of intrastate pipelines or local distribution companies or by intrastate pipelines on behalf of interstate pipelines or local distribution companies served by an interstate pipeline.

**Natural Gas Wellhead Decontrol Act of 1989:** A federal statute enacted in 1989 providing for staged decontrol of first sales with full decontrol of all categories completed by January 1, 1993.

**Natural Gasoline:** Those liquid hydrocarbon mixtures containing substantial quantities of pentane and heavier hydrocarbons which have been extracted from natural gas.

**Natural Monopoly:** A situation where one firm can produce a given level of output at a lower total cost than can any combination of multiple firms. Natural monopolies occur in industries, which exhibit decreasing average long run costs due to size (economies of scale). According to economic theory, a public monopoly governed by regulation is justified when an industry exhibits natural monopoly characteristics.

**Net-Back Price:** The effective wellhead price to the producer of natural gas, based on the downstream market price for the natural gas less the charges for delivering the natural gas to market.

**Net Benefit Test:** In the context of ratemaking, an analysis to determine whether rolled-in or incremental rates for new construction benefit existing customers on a pipeline.

**NGPA Gas Category:** Natural gas pricing category created by the Natural Gas Policy Act of 1978 (NGPA). The NGPA divided all natural gas into more than 20 categories, each subject to different maximum lawful pricing rules.

**No-bump Rule:** Rule which protects a shipper with flowing gas from losing capacity (being bumped) by a higher priority shipper in the interruptible queue deciding to increase its gas volumes.

**Nomination:** A request for service under a service agreement.

**Non-jurisdictional Sales:** A direct sale by an interstate pipeline to an end-user over which the FERC has no jurisdiction, as contrasted with a pipeline's sale for resale in interstate commerce which is jurisdictional.

**Non-operator:** A working interest owner in a well or facility that is not the party designated to operate it.

**No-notice Service:** A pipeline delivery service which allows customers to receive gas on demand without making prior nominations to meet peak service needs and without paying daily balancing and scheduling penalties.

**Non-performance:** A contractual breach, such as contracted gas that is not delivered.

**NOPR:** Notice of Proposed Rule Making. A draft generic policy change promulgated by regulatory agencies.

**Notice of Inquiry:** FERC procedure used to gather information on a specific industry issue.

**Notice of Proposed Rulemaking:** FERC proposal issued with the intent of changing or establishing a FERC rule.



**Obligation to Serve:** The obligation of a utility to provide electric and/or natural gas service to any customer who seeks that service, and is willing to pay the rates set for that service. Traditionally, utilities have assumed the obligation to serve in return for an exclusive monopoly franchise.

**Off Peak:** The period during a day, week, month or year when the load being delivered by a natural gas or electric system is not at or near the maximum volume delivered by that system for a similar period of time. (night vs. day; Sunday vs. Tuesday)

**Off-Peak Gas:** Natural gas supplied during periods of relatively low system demands.

**Offshore:** Any area in the United States federal offshore, i.e., three miles or more offshore, except ten miles or more offshore Texas. A well may be located completely under state waters miles from land and still be classified as an onshore well.

**Off-System Sale:** Sale by a pipeline to a customer other than one of its own traditional firm sales customers.

**Off-System Supply:** Natural gas supply purchased from other than the delivering pipeline or local distribution company. See SYSTEM SUPPLY.

**Oil, Heavy:** Heavy, thick and viscous oils, particularly those found naturally in certain reservoirs in and around Kern County, California, and refinery residuals commonly specified as grades 5 and 6.

**One Hundred Percent Load Factor:** The circumstance in which a customer actually takes all of the service to which it is entitled during a specific period of time.

**Onshore:** Any area within the United States other than that classified as offshore.

**Open Access:** Non-discriminatory, fully equal access to transportation or transmission services offered by a pipeline or electric utility.

**Open Season:** A period of time in which potential customers can bid for pipeline services, and during which such customers are treated equally regarding priority in the queue for service.

**Operational Balancing Agreements (OBAs):** Agreements between pipelines and parties at delivery or receipt points, whereby the parties agree to specified procedures for balancing discrepancies between the nominated levels of service and the actual quantities. The agreements specify gas custody transfer procedures for confirmation of scheduled quantities at specific points.

**Operational Flow Orders (OFOs):** Orders which are issued by a pipeline to protect the operational integrity of the line. The orders may either restrict service or require affirmative action by shippers, such as line pack or draft.

**Operator:** The party in control of the physical operation and maintenance of a well or other facility.

**Option Charge:** A set unit fee or demand charge to be paid at the outset by the recipient of a service based on total entitlement. See also RESERVATION FEE.

**Order No. 497:** A FERC order having to do with the activities of marketing affiliates of interstate natural gas pipeline companies. Among other things, Order No. 497 proscribes the sharing of certain information with marketing affiliates without concurrent disclosure to non-affiliates.

**Over-the-Counter Market:** A general name for any transaction that does not take place on an exchange. There is no central exchange facility for an over-the-counter market which operates through “middlemen”, or dealers. The dealer stands ready to buy or sell a given security on request. The dealer provides the service of allowing the buyer or seller of an asset to make the exchange when he or she desires, rather than waiting to locate a party who wants to do business. An over-the-counter option is a call or a put whose strike price, expiration, and premium are negotiated between two parties.



**Paper Hearing:** A process used by FERC to expedite decisions on the basis of a written record submitted directly to the Commission, instead of an oral hearing before an Administrative Law Judge.

**Parking:** A short-term transaction which allows a customer to hold (park) quantities subject to their firm or interruptible transportation agreements for short periods at the market center for redelivery at a later date. The service often uses storage facilities, but may also use displacement or variations in linepack.

**PCBs:** Synthetic chemicals (polychlorinated biphenyls), manufactured from 1929 to 1977, found in electrical equipment, such as voltage regulators and switches, and used to cool electrical capacitors and transformers. The manufacture of PCBs was banned in 1979.

**Peak Day Demand:** The maximum daily quantity of gas used during a specified period, such as a year.

**Peak Demand:** The maximum load during a specified period of time.

**Peak Load Plant or Peaker Unit:** A plant usually housing low-efficiency, quick response steam units, gas turbines, diesels, or pumped-storage hydroelectric equipment normally used during the maximum load periods. Peakers are characterized by quick start times and generally high operating costs, but low capital costs.

**Peak Shaving:** Methods to reduce the peak demand for gas or electricity.

**Peaking Supply:** A supply of natural gas that is available to meet peak demand. Peaking supply is generally associated with seasonal demand, i.e., colder than normal days. Peaking supply may be provided out of storage facilities, from LNG facilities, from Btu enhancement through the injection of propane or other high Btu substances, or other means.

**Peaking Supply Service:** A service that entitles a buyer to a certain quantity of natural gas delivered at the buyer's request during peak periods.

**Performance Based Rate:** A method of establishing rates which departs from the cost-of-service standard in setting just and reasonable utility rates. Performance Based Rates generally afford utilities the opportunity to increase profits by exceeding targets for efficiency and cost savings. This type of methodology purports to streamline regulatory process by replacing rate hearings with annual, accounting-type reviews. Cost of service studies might not be required at all, once initial rates are fixed.

**Permeability:** A measure of the ease with which a fluid flows through rock in response to pressure differences (measured in darcys). Permeability implies that there is some degree of porosity in the rock.

**Petroleum:** A complex mixture of various hydrocarbons existing in the liquid state found in natural underground reservoirs, often associated with gas. Petroleum includes fuel oil No. 2, No. 4, No. 5, No. 6; topped crude; kerosene; and jet fuel.

**Pipeline:** An entity engaged in the transportation of natural gas in interstate or intrastate commerce. Also, the actual facility itself.

**Pipeline Day:** An arbitrary 24-hour period of time established by a pipeline for the operation of its system, often beginning at seven or eight o'clock in the morning.

**Pipeline Interconnection:** A point at which facilities of two or more pipelines interconnect.

**Pipeline Quality:** Gas See GAS, MARKETABLE.

**Pipeline Safety Improvement Act of 2002:** The Pipeline Safety Improvement Act of 2002, which was signed into law on December 17, 2002, mandated significant changes and new requirements in the way that the natural gas industry ensures the safety and integrity of its pipelines. The law required natural gas transportation companies' operators to prepare and implement an "Integrity Management Program," which among other things requires operators to identify so-called "high consequence areas" (HCA) on their systems, conduct risk analyses of these areas, perform baseline integrity assessments of each pipeline segment, and inspect the entire pipeline system according to a prescribed schedule and using prescribed methods. All segments must be reinspected on a seven-year cycle, with certain exceptions.

*Other provisions of the law include:* (1) Participation in planned-excavation One-Call notification programs; (2) Increased penalties for violations of safety standards; (3) "Whistle-blower" protection for pipeline system employees; (4) Qualification programs for employees who perform sensitive tasks; (5) Authorization of some state participation in interstate pipeline oversight; (6) A required multi-agency program of research, development, demonstration and standardization to enhance the integrity of pipelines; (7) An interagency task force to expedite environmental reviews when necessary to expedite pipeline repairs; and (8) Government mapping of the pipeline system and assembling pipeline operator contact information for public dissemination.

**Pipeline System:** A collection of pipeline facilities used to transport natural gas from source of supply to burner tip, including gathering, transmission, or distribution lines, treating or processing plants, compressor stations, and related facilities.

**Planned Outage:** The removal of a unit from service to perform work on specific components that is scheduled well in advance and has a predetermined duration (e.g., annual overhaul, inspections, testing).

**Point of Unbundling:** The farthest point upstream on a pipeline's system (usually in or contiguous to the production area) when transportation is unbundled from the sale and the point at which title to the gas passes.

**Porosity:** The presence of spaces (pores) between the grains of sand making up a rock formation. Porosity is measured by dividing pore volume by total rock volume.

**Prearranged Release:** An arrangement set between a shipper releasing firm transportation capacity and a prospective acquiring shipper.

**Preliminary Determination:** Conditional approval granted by FERC after the review of all the terms and conditions of a proposed construction project.

**Premium:** In the context of sales of natural gas, a price differential reflecting differences in the quality of the product, services, or relationships, particularly for long-term firm commitments as opposed to spot sales.

**Premium Customer:** A customer that has a high value to the seller, such as a customer that takes at a consistent high load factor, or that pays a high incremental or premium price for the product.

**Pressure, Absolute (psia):** Pressure above that of a perfect vacuum; the sum of gauge pressure and atmospheric pressure.

**Pressure, Atmospheric:** The pressure of the weight of air and water vapor on the earth's surface. The average atmospheric pressure at sea level has been defined for scientific purposes as 14.696 pounds per square inch. The American Gas Association, the FERC and all other federal agencies have adopted 14.73 pounds per square inch as the standard pressure base.

**Pressure, Base:** A standard pressure to which measurements of a volume of natural gas are referred.

**Pressure Base:** The factor for pressure used in determining a gas' volume, expressed in terms of pounds of pressure per square inch that the gas would exert on the walls of a one-cubic-foot container.

**Price:** The amount of money or consideration-in-kind for which a service is bought, sold, or offered for sale.

**Price Cap:** A method of setting a utility distribution company's rates whereby a maximum allowable price level is established by regulators, flexibility in individual pricing is allowed, and where efficiency gains can be encouraged and captured by the company.

**Price Majeure:** The process of retrading interruptible gas which is the result of significant upward or downward price adjustments.

**Price To Earnings Ration (P/E Ratio):** Ratio is calculated by dividing the price per share of common stock by earnings per share over the most recent 12 months. Measured monthly at the enterprise level, it shows the amount investors are willing to pay for \$1 of an enterprise's current earnings.

**Pricing Differential:** The difference between a pipeline's actual gas supply contract costs and a surrogate, such as an index price, for a deemed market price.

**Primary Market:** Primary markets are the markets where new securities are bought and sold. They act as the conduit through which new capital or funds are acquired.

**Primary Recovery:** The recovery of oil and/or natural gas by any method (natural flow or artificial lift) that may be employed to produce them through a single well bore; the fluid enters the well bore by the action of native reservoir energy or gravity.

**Processing Plant:** A facility in which raw natural gas from the wellhead is made to meet pipeline quality specifications and prepared for sale to consumers by reducing or removing undesirable impurities and extracting commercially desirable non-methane hydrocarbons from the gas stream.

**Producer:** A working interest owner of an oil and/or gas well. A producer may sell its share of production itself through the operator of the well, or through another producer.

**Producer Demand Charge:** Fixed charge paid by customers to producers in order to guarantee the availability of supplies.

**Profit:** The income remaining after all business expenses are paid.

**Project-Financed Pipeline:** A pipeline funded by pledging expected revenues to cover the debt.

**Propane (C<sub>3</sub>H<sub>8</sub>):** A hydrocarbon substance consisting of molecules composed of three carbon atoms and eight hydrogen atoms, used primarily in residential and commercial heating and cooling, and as transportation fuel and petrochemical feedstock.

**Propylene (C<sub>3</sub>H<sub>6</sub>):** A hydrocarbon substance consisting of molecules composed of three carbon atoms and six hydrogen atoms, used primarily in residential and commercial heating and cooling, and as a transportation fuel and petrochemical feedstock.

**Proration:** A methodology to allocate a commodity such as pipeline capacity or natural gas supply under which the commodity is split among those seeking to obtain it based on a factor, such as quantity requested or numbers of individuals (per capita).

**Protocol:** An international agreement linked to an existing convention, but as a separate and additional agreement which must be signed and ratified by the Parties to the convention concerned. Protocols typically strengthen a convention by adding new, more detailed commitments.

**Public Utility Holding Company Act (PUHCA or “35 Act”):** A law enacted in 1935 to control the corporate monopoly abuses and misconduct arising from utility market power and insufficient regulatory resources to mitigate it. PUHCA defines allowable structures by which utilities may organize and vests regulatory authority over various financial and corporate matters with the Securities and Exchange Commission (SEC). The National Energy Policy Act of 1992 amended several sections of PUHCA, enabling electric utilities to compete in the independent power market without becoming subject to its terms.

**Public Utility Regulatory Policies Act of 1978 (PURPA):** Federal law that required utilities to purchase electricity from qualified independent power producers at a price that reflects what costs the utilities avoid by buying power from the QF rather than procuring the capacity and energy by another means (See avoided cost). Portions of the act were designed to encourage the development of small-scale cogeneration and renewable resources.

## Q

**Qualifying Facilities (QFs):** A designation, created by the Public Utility Regulatory Policies Act of 1978 (PURPA), for non-utility power producers that meet certain operating, efficiency and fuel use standards set by the Federal Energy Regulatory Commission. To receive status as a qualifying facility (QF) under PURPA, the facility must produce electric energy and “another form of useful thermal energy through the sequential use of energy,” and meet certain ownership, operating, and efficiency criteria established by the Federal Energy Regulatory Commission (FERC). (See the Code of Federal Regulations, Title 18, Part 292.) QFs may rely on renewable energy sources or cogeneration.

## R

**Ratchet or Ratcheted Demand Charge:** The Demand Charge level that a customer pays each month regardless of actual consumption. The demand charge is based on the peak consumption rate during a rolling period of time (usually 12 months.)

**Rate:** The unit charge or charges made by an energy company or utility to customers for energy. Rate structures include:

*Block* - A rate that provides different unit charges for consumption falling within various blocks of demand or consumption.

*Flat* - A rate that provides for a specified charge irrespective of the quantity used or the contract demand.

*Lifeline* - A rate structure applicable for residential customers that includes a specified block of energy use priced below the allocated cost of service. The block of energy may be priced at a flat amount for the entire block or on a per unit basis.

*Mileage-Based* - A rate determined by the length of the haul (e.g. 4¢/100 miles).

*One-Part* - A commodity charge (per-unit rate) with no component charging for reservation, demand, etc.

*Postage-Stamp* - Transportation rate which applies for a given zone or area rather than the distance of actual transportation.

*Seasonal* - A rate that varies based on the season during which the service is received.

*Step* - A rate based on a tiered, or “stepped” price structure. The rate or price depends on the particular step within which the last consumed unit falls.

*Straight-Line* - A charge per unit that is constant regardless of the level of service; i.e., the price does not change with an increase or decrease in the number of units used.

*Three-Part* - A rate that provides three components for determining the total bill, (1) customer charge, (2) demand charge, and (3) commodity charge.

*Two-Part* - A rate that provides two components for determining the total bill, (1) demand charge and (2) commodity charge.

*Volumetric* - A rate or charge for a commodity or service that is calculated and charged on the basis of the amount or volume actually received by the purchaser.

*Zone* - Rate charged for service in a particular zone, where each zone through which energy moves bears a different rate.

**Rate Base:** The value of property upon which a utility is given the opportunity to earn a specified rate of return as established by a regulatory authority. The rate base generally represents the value of property used by the utility in providing service and may be calculated by anyone or a combination of the following accounting methods: fair value, prudent investment, reproduction cost, or original cost. The rate base may include a working capital allowance covering such elements as cash, working capital, materials and supplies, prepayments, minimum bank balances and tax offsets. The rate base may be adjusted by deductions for accumulated provision for depreciation, contributions in aid of construction, accumulated deferred income taxes, and accumulated deferred investment tax credits.

**Rate Design:** The development of electricity prices for various customer-classes to meet revenue requirements dictated by operating needs and costs within current regulatory and legislative policy goals.

**Rate of Return:** The profit a regulated utility is given the opportunity to earn. The allowed rate of return is the percentage determined by the jurisdictional state or federal commission based on standards including the cost of capital in other sectors with comparable risk. The achieved rate of return is the actual result the utility obtained over any given period. In the utility industry, rate of return usually refers to the rate of return on rate base. (See Revenue Requirement.)

**Rate Schedule:** The rates, charges and provisions under which service is supplied to a designated class of customers. Also referred to as a Service Classification.

**Rebundling:** The process under Order No. 636 whereby an agent may act on behalf of a customer to arrange supply, storage and/or transportation service and sell these combined services to a customer.

**Receipt Point:** The point on a pipeline's system at which it receives natural gas into its system.

**Recoverable Gas Reserves:** The quantity of natural gas determined to be economically recoverable and available for delivery from a well or wells at a given price over a specific period of time.

**Redelivery:** Delivery of natural gas by a pipeline, back to a shipper or to a shipper's account that the pipeline had received from the shipper.

**Reforming:** A chemical process that uses heat in presence of a catalyst to break down a substance into desired components; e.g., natural gas or light oils may be reformed into lower Btu fuel gas. Also used to describe the process of refining gasoline designed to burn with fewer emissions.

**Refund Floor:** The most recent just and reasonable gas rate approved by the FERC, which is the lower limit that can be used for calculating refunds resulting from a subsequent rate case.

**Registries, Registry Systems:** Electronic databases that will track and record all transactions under various greenhouse gas emissions trading systems (the "carbon market").

**Regulation:** The governmental function of controlling or directing economic entities through the process of rulemaking and adjudication.

**Regulatory Out Clause:** A contractual provision whereby a party is excused from performance due to the actions of a jurisdictional regulatory agency.

**Releasing Shipper:** A shipper who is the original capacity holder of firm space on a pipeline for which reservation fees are paid, and who desires to sell this capacity under the capacity release program.

**Reliability:** The degree to which the performance of the elements of a system results in power being delivered to consumers within accepted standards and in the amount desired. The degree of reliability may be measured by the frequency, duration, and magnitude of adverse effects on consumer service.

**Removal Permit:** A permit for the removal (export) of gas from a given Canadian province issued by the appropriate government body.

**Replacement Shipper:** A shipper who acquires firm transportation capacity after release by another shipper under the capacity release program. (Also known as “acquiring shipper.”)

**Repressuring:** Forcing natural gas or water, under pressure, into the oil reservoir in an attempt to increase the recovery of crude oil.

**Requirements, Full:** A sale by a supplier to a purchaser in which the seller pledges to meet all of the purchaser’s requirements, or the purchaser pledges to buy all of its requirements from the seller, or both.

**Requirements, Partial:** A sale by a supplier to a purchaser in which the seller pledges to meet a part of the purchaser’s energy requirements.

**Reservation Fee:** A set unit charge payable at the outset by the recipient of a service based on total entitlement. Similar to an “option” charge or “demand” charge. Currently used by natural gas transmission pipelines for firm transportation service.

**Reserves:** Natural gas in natural underground formation in wells, fields or pools.

**Reserves to Production Ratio (RIP):** An estimate used to project the productive life of a field based upon the size of the field compared to the annual production capacity.

**Reservoir:** *Man-made* - A structure which stores water for later use in the production of electricity. *Natural* - A rock stratum that forms a trap in which oil and natural gas may accumulate.

**Residential:** The residential sector is defined as private household establishments which consume energy primarily for space heating, water heating, air conditioning, lighting, refrigeration, cooking and clothes drying. The classification of an individual consumer’s account, where the use is both residential and commercial, is based on principal use.

**Residual Fuel Oil:** The topped crude of refinery operation after the removal of valuable distillates like gasoline; includes No. 5 and No. 6 fuel oils: Residual fuel oil is used for the production of electric power, space heating, vessel bunkering, and various industrial purposes. Imports of residual fuel oil include imported crude oil burned as fuel.

**Restructuring:** The unbundling of pipeline transportation, storage, gathering and sales services and associated realignment of service obligations resulting from Order No. 636.

**Retroactive Ratemaking:** A practice prohibited under the Natural Gas Act which bars increasing gas rates on a retroactive basis.

**Return on Capital Employed (RaCE):** A measure of the effectiveness of a business in using its sources of capital to generate earnings. It is a measure of EBIT divided by capital employed. Capital employed represents the total debt and equity components of the balance sheet.

**Return on Equity:** Compensation for the investment of capital; i.e., earnings. Regulated public utilities statutorily entitled to charge rates that permit them to earn a fair return on their equity invested.

**Return on Invested Capital (ROIC):** A fundamental measure of the earning power of a company. It is equal to earnings before interest and taxes times one minus the tax rate, all divided by total assets minus current liabilities.

**Revenue:** The total amount of money received by a firm from sales of its products and/or services, gains from the sales or exchange of assets, interest and dividends earned on investments, and other increases in the owner's equity except those arising from capital adjustments.

**Revenue Requirement:** The amount of funds (revenue) a utility must take in to cover the sum of its estimated operation and maintenance expenses, debt service, taxes, and allowed rate of return. Revenue requirement is often defined as:

$$\text{Revenue requirement} = \text{expenses} + \text{depreciation} + \text{taxes} + (\text{rate of return} \times \text{rate base}) \text{ or} \\ \text{RR} = \text{E} + \text{D} + \text{T} + (\text{r} \times \text{RB})$$

RR = Revenue Requirement

E = Operating expenses (including taxes other than income taxes)

D = Depreciation expense

T = Income taxes

r = Rate of return (percentage authorized to the utility)

RB = Rate base (net investment in facilities serving customers)

**Right of First Refusal:** Process which allows any long-term firm gas transportation customer, including formerly bundled city-gate sales customers, to continue receiving firm gas transportation service by paying up to the maximum rate and matching the length of a term offered by another customer who is seeking service.

**Risk Management:** Risk management is the reducing of the prospect of losses which will interfere with the execution of a company's business strategy. It allows managers to focus directly on shareholder value as an objective in decision making.

A risk management program frequently involves five steps:

1. identify the source of exposure
2. quantify the exposure
3. clarify the impact of the exposure on the company's overall business strategy
4. assess the capability for managing the exposure internally .
5. select the appropriate risk management products.

**Rolled-in Pricing:** A pricing method which establishes rates on a weighted average of all costs, as opposed to allocating specific costs to specific customers.

**Rollover Clause:** In natural gas contracts, a contract clause that permits a contract to extend beyond the initial term. In futures contracts, a straddle trading procedure involving the shift of one month of a straddle into a future month, while maintaining the other contract month of the original spread.

**Royalty:** With respect to oil and gas properties, a share of production, which mayor may not bear a share of expenses of production, depending upon the terms of the specific lease.

**Royalty Owner:** A person who owns a royalty interest in production.

**Rules of Conduct:** Rules set in advance to delineate acceptable activities by participants, particularly participants with significant market power.



**Sales for Resale:** Energy supplied to other utilities, cooperatives, municipalities, and federal and state agencies for resale to ultimate consumers. Sales for resale are wholesale sales and may be subject to FERC regulations.

**Sand:** Sand or porous sandstone in underground strata that contains natural gas.

**Scheduled Outage:** The shutdown of a generating unit, transmission line, or other facility, for inspection or maintenance, in accordance with an advance schedule.

**Scheduling Penalty:** A penalty assessed for differences between the amount of gas scheduled and the amount of gas tendered for delivery.

**Seasonal Rate:** See RATE, SEASONAL.

**Seasonal Service:** Service sold only during certain periods of the year. Seasonal service may be sold either on a firm or on an interruptible basis.

**Secondary Recovery:** All methods of oil and natural gas extraction in which energy sources extrinsic to the reservoir other than pumps or pumping units are used.

**Section 311 Transportation:** Transportation service provided by a pipeline pursuant to NGPA section 311 authorization. Under NGPA section 311, an interstate pipeline may provide transportation service on behalf of an intrastate pipeline or a local distribution company, and an intrastate pipeline may provide transportation service on behalf of an interstate pipeline or a local distribution company served by an interstate pipeline.

**SEC:** Securities and Exchange Commission.

**Sectoral Approach:** Mitigation actions, such as emissions caps and intensity targets, applied to an entire global sector. Proponents of the sectoral approach suggest that they limit the competitive distortions within an industry that may occur when a sector operates in a number of countries with differentiated national actions on climate change.

**Section 4, Natural Gas Act:** Section 4 (U.S.C. §§ 717c) is the provision in the Natural Gas Act (NGA) that authorizes natural gas companies (a statutory term that includes interstate natural gas pipelines) to petition the Federal Energy Regulatory Commission (FERC or Commission) to approve rates for services subject to the Commission's jurisdiction under the NGA. Specifically, section 4 (1) establishes the "just and reasonable" and non-discriminatory standards for rates charged by interstate natural gas pipelines; (2) governs the publication in tariffs of pipeline rates and conditions for providing natural gas transportation service; and (3) specifies the procedures for Commission review of rate or other tariff changes proposed by pipelines. A pipeline's rates, once established, continue in effect until the pipeline makes a subsequent rate case filing (and the new rates are deemed just and reasonable) or the Commission makes a finding under section 5 of the NGA that the existing rates are no longer just and reasonable and new rates are just and reasonable are established.

**Section 5, Natural Gas Act:** Section 5 of the Natural Gas Act (NGA), 15 U.S.C. § 717d, authorizes the Federal Energy Regulatory Commission (FERC or Commission), any state, municipality, state commission or gas distribution company to challenge a natural gas company's existing tariff rates provided that they show that the current rate or charge is unjust and unreasonable and that a new rate is just and reasonable. A proceeding under section 5 can be initiated by the FERC alone or in response to a complaint by a third party. If the FERC or the complaining customer carries its burden of showing the existing rate or practice is "unjust and unreasonable," the FERC can order a new just and reasonable rate or practice to take its place. Under section 5, the new just and reasonable rate takes effect prospectively from the date of the finding that the existing rates were unjust and reasonable.

**Section 7, Natural Gas Act:** Section 7 of the Natural Gas Act (NGA), 15 U.S.C. 717f, authorizes the Federal Energy Regulatory Commission (FERC or Commission) both (1) to issue certificates of public convenience and necessity, which are required to build or modify interstate natural gas pipeline facilities and which are also required to initiate service through those facilities, and (2) to approve the abandonment of such certificates when facilities are retired or services are discontinued.

**Securitize:** The aggregation of contracts for the purchase of the power output from various energy projects into one pool which then offers shares for sale in the investment market. This strategy diversifies project risks from what they would be if each project were financed individually, thereby reducing the cost of financing.

**Seepage:** The escape of injected CO<sub>2</sub> from a storage reservoir during CCS operations.

**Selective Discounting:** The ability of pipelines to charge discounted transportation rates to customers under FERC Order No. 436.

**Sendout:** The total natural gas produced or purchased (including exchange gas receipts), or the net natural gas withdrawn from underground storage within a specified time interval, measured at the point of production, purchase, or withdrawal, adjusted for changes in local storage quantity. Gas send-out is comprised of natural gas sales, exchanges, deliveries, natural gas used by the company and unaccounted for gas.

**Service Area:** The territory in which a utility system is required or has the right to supply service to ultimate customers.

**Service Classification:** See RATE SCHEDULE.

**Service Connection (Service Pipe):** The pipe that carries natural gas from a main to a customer's meter.

**Service Obligation:** The obligation of a natural gas company to perform the services required by law or certificate regardless of whether the company has contractual duties.

**Shareholder Value:** A measure of the economic value of a business entity, where the economic value is equal to the net present value of expected cash flows discounted at the cost of capital. Unlike other financial measures, shareholder value encompasses the time value of money and addresses aspects such as risk, investment requirements and accounting methods.

**Shaving:** See PEAK SHAVING.

**Shipper:** One who contracts with a pipeline for transportation of natural gas and who retains title to all natural gas while it is being transported by the pipeline.

**Short Run Marginal Cost:** All variable production costs.

**Shrinkage:** The reduction in volume of wet natural gas due to the removal of natural gas liquids, hydrogen sulfide, carbon dioxide, water vapor, and other impurities from the natural gas.

**Smart Pig:** A Smart Pig is a pipeline inspection gauge that performs various maintenance operations, such as cleaning and inspection, without stopping the flow of the product in the pipeline. Pigging is accomplished by inserting the pig into a pig launcher – a funnel shaped Y section in the pipeline. The launcher is then closed and the pressure of the product in the pipeline is used to push the pig through the pipe until it reaches the receiving trap – the pig catcher. The tool is called a “pig” because of the squealing sound that it makes when moving through the pipeline.

**Source-Specific Gas Sales Contract:** A contract that commits the seller to deliver natural gas, usually within a stated maximum and minimum, from specific described and committed natural gas reserves or sources.

**Specific Gravity:** As applied to natural gas, specific gravity is the ratio of the weight of a given volume to that of the same volume of air, both measured under the same conditions.

**Spot Market:** Commodity transactions in which the transaction commencement is near term (e.g., within 10 days) and the contract duration is relatively short (e.g., 30 days).

**Spot Purchases:** A short-term single shipment sale of a commodity, including electricity or gas, purchased for delivery within one year, generally on an interruptible or best efforts basis. Spot purchases are often made to fulfill a certain portion of energy requirements to meet unanticipated energy needs, or to take advantage of low prices.

**Standard Industrial Classification (SIC):** A set of codes developed by the Office of Management and Budget, which categorizes business into groups with similar economic activities.

**Standard Metering:** Base Standard conditions, plus agreed corrections, to which all natural gas volumes are corrected for purposes of comparison and payment.

**Standards of Conduct:** Requirements under FERC’s marketing affiliate rule, which prohibit discrimination in favor of the pipeline’s own marketing affiliates and which require pipelines to submit reports detailing compliance with the rules.

**Standby Charge:** A set unit fee payable at the outset by the recipient of a service based on total entitlement imposed on each unit of natural gas not purchased from, but transported by, the pipeline (similar to a “demand” charge). The charge is intended to recover fixed costs otherwise recoverable in the sales commodity charge.

**Storage Facility:** Facility used for the storage of natural gas; usually a cavern carved out of natural salt domes or depleted natural gas reservoirs into which natural gas can be reinjected and produced with minimal loss.

**Storage Service:** A service in which natural gas is received by the seller of the service and held for the account of the customer for redelivery at a later time. Storage services are typically utilized by customers to allow more even purchases or sales of natural gas throughout the year, despite variations in end-use demand. Storage service is also a critical element of the peak period deliverability of many interstate natural gas pipelines and distributors. Injection, withdrawal and holding fees are usually charged, and limits an rates, times of injection and withdrawal, and maximum volumes to be held are usually imposed.

*Underground Storage* - The utilization of subsurface facilities for storing natural gas that has been transferred from its original location for the primary purposes of conservation, fuller utilization of pipeline facilities, and more effective and economic delivery to markets.

**Straddle Plant:** A natural gas processing plant constructed near a transmission pipeline downstream from the fields where the natural gas in the pipeline has been produced. Also called an “on-line” plant. Generally, the straddle plant does not purchase and resell natural gas, but provides only a processing service for the owner of the natural gas or of processing rights to the natural gas. Frequently, natural gas producers reserve processing rights when they sell natural gas, so they can have natural gas liquids removed from the gas stream by a straddle plant.

**Straight Fixed Variable (SFV):** Rate Design A rate design method applied by the FERC on gas pipelines which allocates all fixed costs to the demand component and all variable costs to the commodity, or usage component.

**Straight Gas Utility:** A utility company that derives the major portion of its total sales revenues from natural gas operations.

**Stranded Costs:** Under FERC Order No. 636, costs associated with certain gas pipeline assets previously used to provide bundled sales service, such as gas in storage and capacity on upstream pipelines, can no longer be assigned to customers of the unbundled services.

**Stranded Investment:** An investment with a cost recovery schedule that was initially approved by regulatory action that subsequent regulatory action or market forces has rendered not practically recoverable. Costs that electric utilities are currently permitted to recover through their rates but whose recovery may be impeded or prevented by the advent of competition in the industry.

**Submetering:** The practice of remetering purchased energy beyond the customer’s utility meter, generally done when natural gas or electricity is distributed to building tenants through privately-owned or rented meters.

**Subsidization:** The imposition of costs on one customer or class of customers that are attributable to services provided to other customers or classes of customers, who therefore pay less than the appropriate actual costs for the services they receive.

**Summer Valley:** The depression that occurs in the summer months in the daily load of a natural gas distribution system or pipeline.

**Sunk Cost:** In economics, a sunk cost is a cost that has already been incurred, and therefore cannot be avoided by any strategy going forward.

**Supervisory Control and Data Acquisition (SCADA):** A system of remote control and telemetry used to monitor and control the transmission system.

**Supply Pooling Service:** Supply pooling is a service that allows customers to aggregate firm or interruptible service at logical points in order to provide for a more efficient distribution of transactions with other customers.

**Suspension:** The authority of the FERC under the Natural Gas Act to accept a rate filing, to go into effect as early as one month (absent waiver) or as late as five months, subject to refund.

**Swing Supply:** A supply of natural gas that is the last to be taken and the first to be curtailed by the customer. Swing supply serves the variation in the customer’s demand.

**Swing Supply Service:** A service in which the supply being offered will be the last to be purchased by the customer if there is additional demand and the first to be curtailed by the customer if there is any reduction in demand.

**System Supply:** Natural gas supplies purchased, owned and sold by the supplier. System supply gas of interstate pipelines is subject to FERC regulation.



**Take-or-Pay Clause:** A contract provision obligating the buyer to pay for a certain minimum quantity of product, whether or not the buyer actually takes that quantity during the stated period.

**Take-or-Pay Quantity:** Under a take-or-pay clause, the minimum amount of product that the buyer is obligated to pay for whether or not the buyer actually takes that amount of product, usually stated in terms of an absolute quantity, or a percentage of total contract quantity, over a specific period of time, usually a year.

**Take-or-Pay Surcharge:** A surcharge to an interstate pipeline's sales and transportation rates permitted by FERC, designed to recover the pipeline's costs of settling its historic take-or-pay liabilities.

**Targets and Timetables:** A target is the reduction of a specific percentage of greenhouse gas emissions (e.g. 6 percent) from a base year (e.g. 'below 1990 levels') to be achieved by a set date, or timetable (e.g. 2008–12). For example, under the Kyoto Protocol's formula, the EU has agreed to reduce its GHG emissions to 8 percent below 1990 levels by the 2008–12 commitment period. These targets and timetables are, in effect, a cap on the total amount of GHG emissions that can be emitted by a country or region in a given time.

**Tariff:** A document filed by a regulated entity with either a federal or state commission. It lists the rates the regulated entity will charge to provide service to its customers as well as the terms and conditions that it will follow in providing service.

**Tertiary Recovery:** Enhanced methods for the recovery of oil and natural gas that require a means for displacing the oil or natural gas from the reservoir rock, modifying the properties of the fluids in the reservoir, and/or the reservoir rock to cause movement of the oil or natural gas in an efficient manner and providing the energy and drive mechanism to force its flow to a production well.

**Test Period:** In a pipeline rate case, a test period is used to determine the cost of service upon which the pipeline's rates will be based. A test period consists of a base period of twelve consecutive months of recent actual operational experience, adjusted for changes in revenues and costs that are known and are measurable with reasonable accuracy at the time of the rate filing and which will become effective within nine months after the last month of actual data utilized in the rate filing.

**Therm:** A unit of heating value equivalent to 100,000 British thermal units (Btu) (0.1 MMBtu).

**Tiered Rates:** A rate design which divides customer use into different tiers, or blocks, with different prices charged for each.

**Time-of-Use (TOU) Rates or Pricing:** A rate design imposing higher charges during periods of the day when relatively higher peak demands are experienced.

**Transition Costs:** Costs associated with the change of an industry from a regulated, bundled service to a competitive open-access service, including "Stranded Costs."

**Transmission Company:** A company which obtains the major portion of its natural gas operating revenues from the operation of a natural gas transmission system and/or from mainline sales to industrial customers.

**Transmission (Trunk) Line:** Pipeline transporting natural gas from principal supply areas to distribution centers, large volume customers or other transmission lines. Transmission lines generally have a linear configuration, may be quite large in diameter, operate at relatively high pressure, and traverse long distances.

**Transportation:** The transfer of gas from one interconnected pipeline to another pipeline through a header (hub), by displacement (including exchanges), or by physical transfer over the transmission of a market center pipeline. (Sometimes referred to as “wheeling.”) The Federal Energy Regulatory Commission defines transportation as including storage, exchange, backhaul, displacement, or other methods of transportation. See 18 C.F.R. § 284.1(a).

**Transportation Contract:** A contract setting forth the terms and conditions applicable to gas or electric transportation service.

**Transporter:** The pipeline company that transports natural gas for a shipper.

**Treating Plant:** Facility that treats raw natural gas to remove undesirable impurities such as carbon dioxide, hydrogen sulfide, and water vapor. Treating plants may be owned by producers, independent treaters, or transmission pipeline companies.

**Trunk Lines:** See PIPELINE SYSTEM.



**Ultimate Customer:** A customer that purchases energy for consumption and not for resale.

**UN Framework Convention on Climate Change or UNFCCC:** A treaty signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries. Its ultimate objective is the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system.” While no legally binding level of emissions is set, the treaty states an aim by Annex I (developed) countries to return these emissions to 1990 levels by the year 2000. The treaty took effect in March 1994 upon the ratification of more than 50 countries; over 180 nations have now ratified. In March 1995, the UNFCCC held the first session of the Conference of the Parties (COP) the supreme body of the Convention in Berlin. Its Secretariat is based in Bonn, Germany.

**Unbundled Services:** The selling and pricing of energy services separately as opposed to offering services “bundled” into packages with a single price for the whole package. With unbundling, separate fees are charged for each service, based upon only the costs of providing that service. (i.e., transportation, storage, generation, production, etc.)

**Undue Discrimination:** A subjective standard for determining illegal rates or service under the Natural Gas Act and the Federal Power Act, which is applied on a case by case basis.

**Uniform System of Accounts:** Prescribed financial rules and regulations established by the Federal Energy Regulatory Commission for utilities subject to its jurisdiction under the authority granted by the Federal Power Act.

**Universal Service:** Electric service sufficient for basic needs (an evolving bundle of basic services) available to virtually all members of the population regardless of income.

**Upstream Pipeline:** The pipeline delivering natural gas to another pipeline at an interconnection point where the second pipeline is closer to the consumer.

**Used and Useful:** The traditional test for whether a utility asset may be included in rate base, self-defined and subjective.

**Utility:** A regulated entity which exhibits the characteristics of a natural monopoly. For the purposes of electric industry restructuring, “utility” refers to the regulated, vertically integrated electric company. “Transmission utility” refers to the regulated owner/operator of the transmission system only. “Distribution utility” refers to the regulated owner/operator of the distribution system which serves retail customers.

**Utilization Factor:** A ratio of the maximum demand of a system or part of a system to its rated capacity.



**Vapor:** The gaseous state of a substance.

**Variable Cost:** The total costs incurred to produce energy, excluding fixed costs which are incurred regardless of whether the resource is operating. Variable costs usually include fuel, increased maintenance and additional labor.

**Venture Capital:** Funds available to invest in new or unproven business enterprises.

**Vertical Integration:** An arrangement whereby the same company owns all the different aspects of making, selling, and delivering a product or service. In the electric industry, it refers to the historically common arrangement whereby a utility would own its own generating plants, transmission system, and distribution lines to provide all aspects of electric service.

**Volatility:** A measurement of the price fluctuation of an underlying instrument that takes place over a certain period of time.

**Volumetric Rate:** See RATE, VOLUMETRIC.



**WAG Ratio:** The ratio of water to gas in a WAG process.

**Warranty Contract Reserves:** Natural gas supplies committed to warranty natural gas contracts. Generally, the producer does not dedicate specific reserves underlying any specific acreage, lease, or fields to a warranty agreement.

**Warranty Gas Sales Contract:** A natural gas sales contract in which the seller commits to deliver a stated quantity of natural gas over a stated period of time, without limitation to or commitment of specific reserves or sources of natural gas, and generally with no production-related reservations.

**Weighted Average Cost of Gas (WACOG):** The weighted average unit cost of a supply of natural gas. WACOG is calculated as the total cost of all natural gas purchased during a base period divided by either the total quantity purchased (unit of production) or the system throughput (unit of sales) during the same period.

**Well, Wildcat:** An exploratory well drilled in unproven territory, including a horizon from which there is currently no production in the general vicinity.

**Wellhead Price:** The price received by the producer for sales at the well.

**Wet Bulb Temperature:** The temperature a sample of air would have if cooled adiabatically to saturation at constant pressure by evaporation of water into it, all latent heat being supplied by the sample of air.

**Wheeling:** Transfer of gas from one interconnected pipeline to another through a header (hub), by displacement (including exchanges), or by physical transfer over the transmission of a market center pipeline.

**White Oil:** Liquefied natural gas which is produced from refrigeration units at a well site.

**Wholesale Sales:** Energy supplied to other electric utilities, cooperatives, municipals, federal and state electric agencies and power marketers for resale to ultimate consumers.



**Zone of Reasonableness:** A standard utilized to define just and reasonable rates under the Natural Gas Act.

**Zone Rate:** See RATE, ZONE.