NARUC, EWURA & ICC First Partnership Activity

Demonstration on Developing a Pricing Methodology for Gas Processing, Transmission, Distribution and Storage

Presented by

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Illinois Commerce Commission

Tuesday August 13th, 2013
Dar es Salaam, Tanzania

Good Afternoon

- I am from the Illinois Commerce Commission
  - In my forth year as a commissioner there
  - My educational background is in political studies
  - My professional experience is in community organizing, consumer advocacy and legislative affairs
- I bring you greetings from the Chairman Douglas Scott, the other ICC Commissioners and the staff of the ICC
- I represent the ICC on the NARUC Consumer Affairs Committee, the Subcommittee on Clean Coal and Carbon Sequestration, and the Committee on Gas
- I am speaking with you today and tomorrow about natural gas and its development in your country
- My goal today is to open a channel of communications with you
- I personally do not have the answers you are seeking but am here representing a national system that works and together we can work to develop plans

General Outline for Today

- Our commitment to you
- Gas and the world market
- Overview of the US energy regulation structure
- Overview of a market based natural gas system
  - Investment drivers, and
  - Keys to an active private sector participation
- The US Natural Gas System – an overview
- Rate Structures – both federal and state
- Gas Market Models
- Lessons Learned From Experience

Our General Commitment to You

- We are here to do the best possible job of getting you what you need to be a success
- We understand this very significant initiative for you and we want to assist you in building on your aspirations to create an energy infrastructure and delivery system that Tanzania can be proud of.
- We know that the US experience is not always directly transferable. There will be significant differences from our system and yours. But we are committed to sharing our experience with you and helping find what will work for you here in Tanzania.
- We will be as flexible as possible to tailor this experience for you.
- What will make this most effective is an open dialogue with a back and forth discussion.

Regional Gas Markets in Key World Markets

As you know, gas-powered generation is the largest source of growth in electricity production in the world.

- Some gas fired plants have been traditional thermal plants, either newly constructed or conversions.
- By far, most new capacity has relied on gas-fired turbines either straight or combined cycle or combined heat and power.

Gas-fired Generation is Increasing Worldwide

Factors effecting gas-fired generation include

- **Advances in generation technology**
  - **Advances in jet engines, largely developed for aircraft, have spun off applications in power generation.**
  - **Combined cycle applications have yielded increased efficiency in converting gas to electricity and allow efficiencies to approach 60%.**
- **Modular component size tends to be financeable, sitable and scalable**
- **Increased environmental regulation**
  - **CO2 conscious world: C (carbon) versus CH4 (methane)**
- **Revised choices with respect to generation methods,**
  - **Gas is trending more popular than oil, coal and nuclear**
- **Most recently, new and plentiful supplies of natural-gas obtained using new drilling and production technology.**
  - **Deep drilling, directional drilling and hydraulic fracturing**
  - **Pipelines are bigger exploiting scale economies**
  - **More storage has been developed as well**

Investment Drivers in the Gas-to-Power Business

- I have found that the best answers come from good questions. I think some of those questions are:
- What are the important factors that investors are looking for when they choose to build and operate an electric power plant?
- How do investors choose between alternative projects?
- What other considerations are important besides financial returns?
- How do long-term commitments play into the considerations?
- How do factors such as risk, security, and political stability influence decisions?

Establishing a Methodology for Sustained Private Sector Participation in Gas to Power

- When prices provide the reasonable ability for investors to profit over the life of the investment , capital will flow to the privately financed production of electricity from natural gas and the necessary other aspects of gas supply.

- Profitability will necessitate appropriate compensation for commodity (energy) services and capacity in both electric and natural gas markets.

- The transition to market-derived prices for electricity can be a challenging situation for regulators.

Ideal National Framework for IPP Development

- **Other arrangements are possible, but ideally a favorable investment climate has the following elements which can lead to the lowest cost supply**

- **Well Functioning legal system**
  - Enforcement of contracts
  - uphold rule of law
  - resolve disputes

- **Robust Banking Infrastructure**

- **Effective Executive Government and Agencies**

- **Economic stability, good repayment record and investment grade rating**

- **Regulatory/institutional/ownership framework**
  - legislatively protected
  - Obtainability of licenses, permits, right of ways

Ideal National Framework for IPP Development

- **Effective regulation**
  - Transparent
  - Consistent - predictable - independent - efficient
  - Cost-based tariffs
  - Explicit rather than implicit subsidies
  - Due Process
  - Fair implementation of laws and rules
  - Professional conduct
  - Protective of sensitive information through non-disclosure agreements
  - Enforceability of decisions
- **Comprehensive framework** for power system development **and planning and a commitment** to making the plans realistic and workable
- Transmission and natural gas **infrastructure**
- Skilled and available **workforce** and other suppliers.
- Responsive pragmatic **problem solving**

Factors Affecting Natural Gas Prices

- Natural gas prices are a function of market supply and demand.
- Because of limited alternatives for natural gas consumption or production in the short run, even small changes in supply or demand over a short period can result in large price movements to bring supply and demand back into balance.
- This is changing due to the current large supply.

Factors on the supply side that may affect prices include:

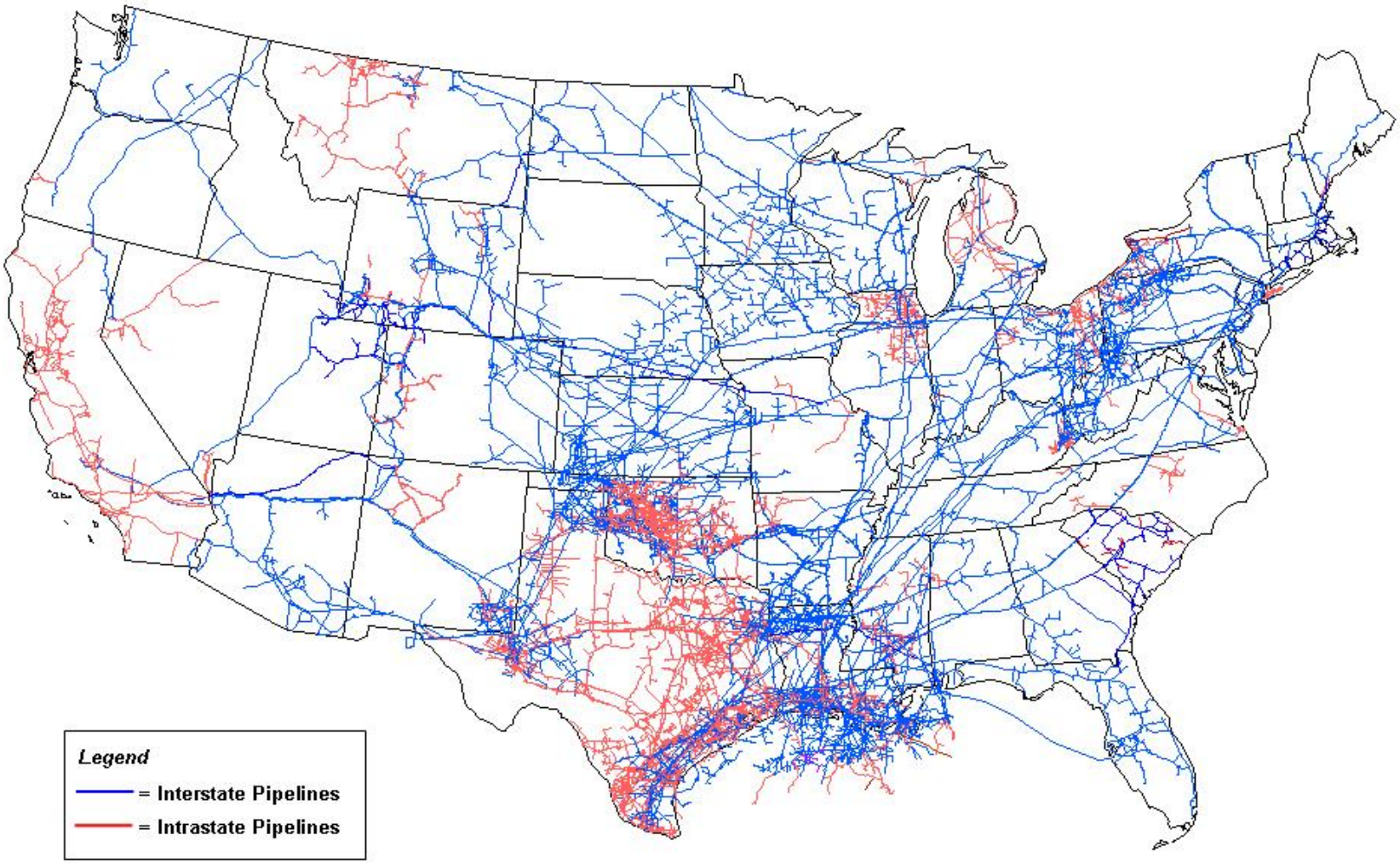
- Variations in the amount of natural gas being produced
- The volume of gas being imported and/or exported
- The amount of gas in storage facilities (referred to as storage levels)
- Increases in supply result in lower prices, and decreases in supply tend to increase prices.

Factors on the demand side that may affect prices include:

- The level of economic growth
- Variations in winter and summer weather
  - Tropical Storm Katrina in August 24, 2005
- Higher demand tends to lead to higher prices, while lower demand tends to lead to lower prices.

Factors Affecting Natural Gas Prices

- **Domestic Natural Gas Prices Driven Primarily by Supply and Demand**
- **Severe Weather Can Disrupt Production**
  - **Winter Weather Strongly Influences Residential and Commercial Demand**
  - **Hot Summer Weather Can Increase Power Plant Demand for Gas**
- **Natural Gas Supplies Held in Storage Play a Key Role in Meeting Peak Demand**
- **Economic Growth Can Affect Natural Gas Demand and Prices**
- **Competition with Other Fuels Can Influence Natural Gas Prices**
  - Large-volume gas consumers can switch between natural gas, coal, and oil, depending on the prices of each fuel.



Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System

The U.S. natural gas pipeline network

- The U.S. natural gas pipeline network is a highly integrated transmission and distribution grid that can transport natural gas to and from nearly any location in the lower 48 States. The natural gas pipeline grid comprises: More than 210 natural gas pipeline systems.
- 305,000 miles of interstate and intrastate transmission pipelines
- More than 1,400 compressor stations that maintain pressure on the natural gas pipeline network and assure continuous forward movement of supplies
- More than 11,000 delivery points, 5,000 receipt points, and 1,400 interconnection points that provide for the transfer of natural gas throughout the United States.
- 24 hubs or market centers that provide additional interconnections
- 400 underground natural gas storage facilities
- 49 locations where natural gas can be imported/exported via pipelines
- 8 LNG (liquefied natural gas) import facilities and 100 LNG peaking facilities

Regulatory Authorities

- In the United States, the Federal Energy Regulatory Commission (FERC) regulates the interstate natural gas transportation (transmission) segment of the natural gas industry.
- The safety of that system (pipeline safety) is regulated by the US Department of Transportation's Office of Pipeline Safety (OPS).
- In April 1992, the Federal Energy Regulatory Commission (FERC) issued its Order 636 and transformed the interstate natural gas transportation segment of the industry forever.
- Under it, interstate natural gas pipeline companies were required to restructure their operations by November 1993 and split-off any non-regulated merchant (sales) functions from their regulated transportation functions.
- This new requirement meant that interstate natural gas pipeline companies were allowed to only transport natural gas for their customers.
- The restructuring process and subsequent operations have been supervised closely by FERC and have led to extensive changes throughout the interstate natural gas transportation segment which have impacted other segments of the industry as well.

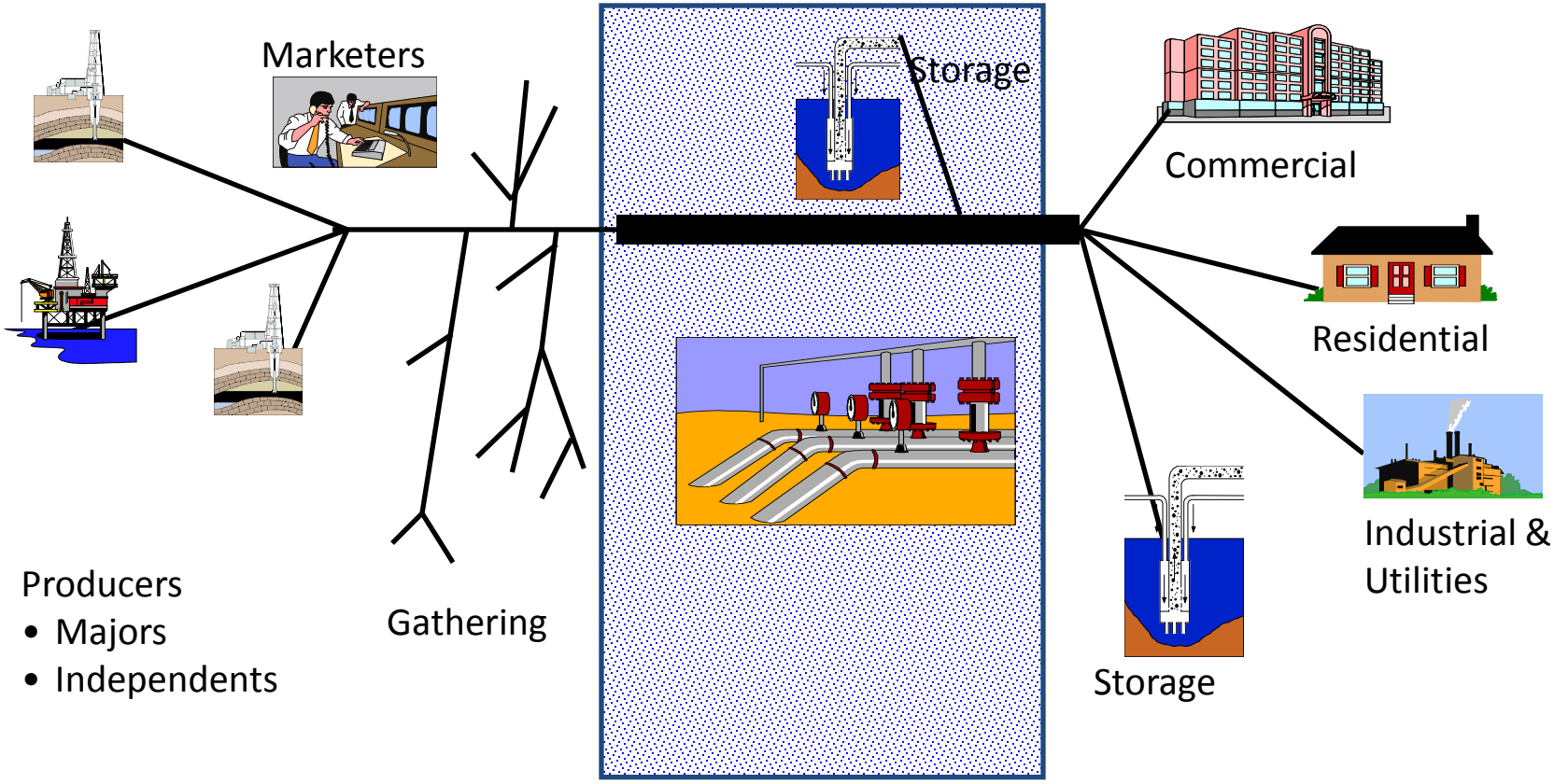
US - Federal Jurisdiction (continued)

- At one time, FERC regulated the prices for natural gas commodity as well as the prices to transport and store natural gas on interstate pipelines (those that operate in two or more states).
- In 1983, the U.S. Congress deregulated the price of natural gas commodity. Natural gas prices are now determined by the market.
- FERC now only regulates prices of natural gas interstate pipeline services.
- FERC also has jurisdiction for the construction and siting of interstate gas transmission and storage.
- This is distinct from electric transmission in the U.S. in which the states retain construction and siting authority.

Transporting Natural Gas from Wellhead to Market

- **Separate and important aspects of the entire system**
- **This involves a series of processes and an array of physical facilities. Among these are:**
  - **Gathering Lines** – These small-diameter pipelines move natural gas from the wellhead to the natural gas processing plant or to an interconnection with a larger mainline pipeline (unregulated).
  - **Processing Plant** – This operation extracts natural gas liquids and impurities from the natural gas stream (unregulated)
  - **Mainline Transmission Systems** – These wide-diameter, long-distance pipelines transport natural gas from the producing area to market areas (regulated by FERC)
  - **Market Hubs/Centers** – Locations where pipelines intersect and flows are transferred (market driven)
  - **Underground Storage Facilities** – Natural gas is stored in depleted oil and gas reservoirs, aquifers, and salt caverns for future use (regulated by FERC and PUC's)
  - **Local Distribution** (local distribution companies, LDCs, regulated by state PUCs)
  - **Local distribution - L**ocal Distribution Companies (LDC's) are regarded as a natural monopoly (total costs are lower for one provider than for multiple providers), so there is only one provider per area (regulated by state PUCs)
  - **Consumers** - they vary in size and how they use gas

Structure of the U.S. Natural Gas Sector



Not Regulated	Regulated by some States	Regulated by FERC and DOT	Regulated by States

Regulations Today

- The natural gas pipelines are owned and operated by private business
- Most natural gas pipeline owners in the United States, including many in the intrastate segment as well, now only transport natural gas and no longer buy and sell it.
- Although interstate natural gas pipelines are no longer subject to as much regulation as before Order 636, many aspects of their operations and business practices, are still subject to regulatory oversight.
- For example: Prices are established by Federal Energy Regulatory Commission (FERC)
  - Prices are set using traditional cost of service regulation methods.
  - FERC determines the rate-setting methods for interstate pipeline companies;
  - FERC sets the rules for business practices and costs include (capital costs, depreciation, taxes, and operations, maintenance, and administrative costs)
  - Under cost of service regulation, the total costs are determined and then a rate design is developed pricing for the services through which the provider recovers its costs.
  - FERC has the sole responsibility for authorizing the siting, construction, and operations of:
    - interstate pipelines;
    - natural gas storage fields;
    - and liquefied natural gas (LNG) facilities.

Cost recovery

Retail customers ultimately pay all the costs to get the gas from the well head to the burner tip. Those costs are recovered separately by the various segments.

–**Production:** producers are compensated at the market price.

–**Transmission:** pipelines enter into contracts to transport gas from the field to various markets, which includes utility citygates (where transmission and distribution meet). Those contracts are constrained by tariffs.

–**Distribution:** LDCs recover their costs through distribution charges directly to customers.

Rate Design

- FERC uses straight fixed variable costs (“SFV”) method to design gas transmission and storage rates.
- Under SFV, fixed costs are recovered through demand charges (the amount a customer reserves on the pipeline) which are charged on a monthly basis.
- Monthly transmission rates are based upon the amount of peak delivery on the pipeline for which the customer contracts and are paid whether the reserved amount is used or not.
- There is a secondary market where the customer can sell the reserved amount they are not going to use.
- Monthly storage rates are based upon maximum withdrawal rate for which the customer contracts.

Rate Design (continued)

- Variable costs are recovered via charges on amount of gas actually transported in the case of transportation.
- For storage there is a variable amount charged for actual amount (volume metric) of gas withdrawn or injected in the case of storage.
- These variable charges are usually very small relative to the fixed charges collected through monthly demand (fixed) charge.
- Pipelines use some of the gas transported to power gas compressors. They take a percentage of the customer's gas for this purpose. The longer the haul, the higher percentage of gas is taken.

Coordinating with other Regulatory Agencies

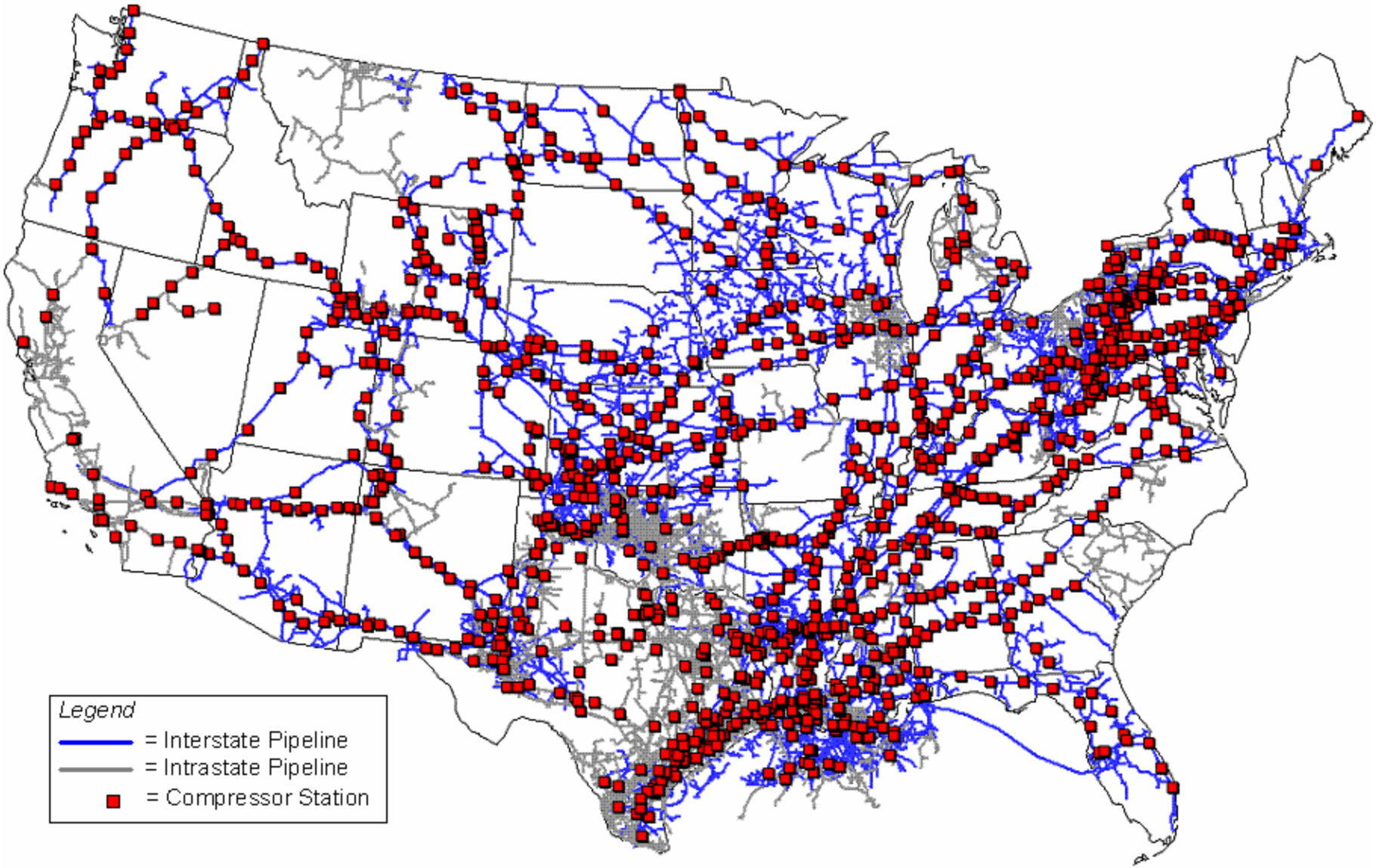
- There are other agencies involved as well:
- Almost all applications to FERC for interstate natural gas pipeline projects require some level of coordination with one or more other Federal agencies. For example:
  - The Environmental Protection Agency assists FERC and/or State authorities in determining if the environmental aspects of a pipeline development project meet acceptable guidelines.
- FERC is also required to take the lead on the environmental reviews under the National Environmental Policy Act, the Endangered Species Act, and the National Historic Preservation Act.

Coordinating with other Regulatory Agencies

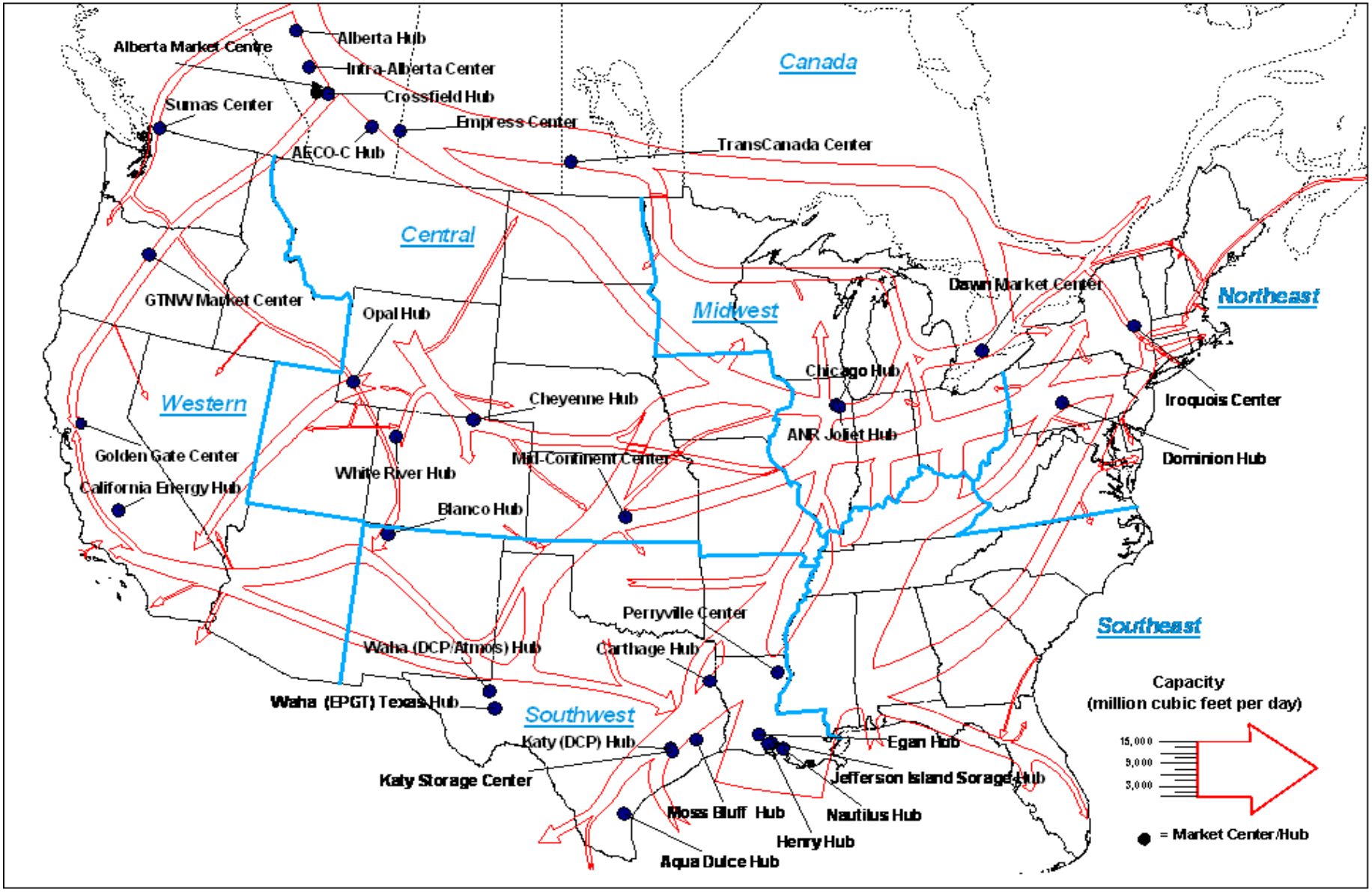
- Governing the safety standards, procedures, and actual development and expansion of any pipeline system is the job of the U.S. Department of Transportation's Office of Pipeline Safety (OPS).
- A pipeline may not begin operations until a line, or line segment, has been certified safe by the OPS.
- The OPS retains jurisdiction for safety over the lifetime of the pipeline.

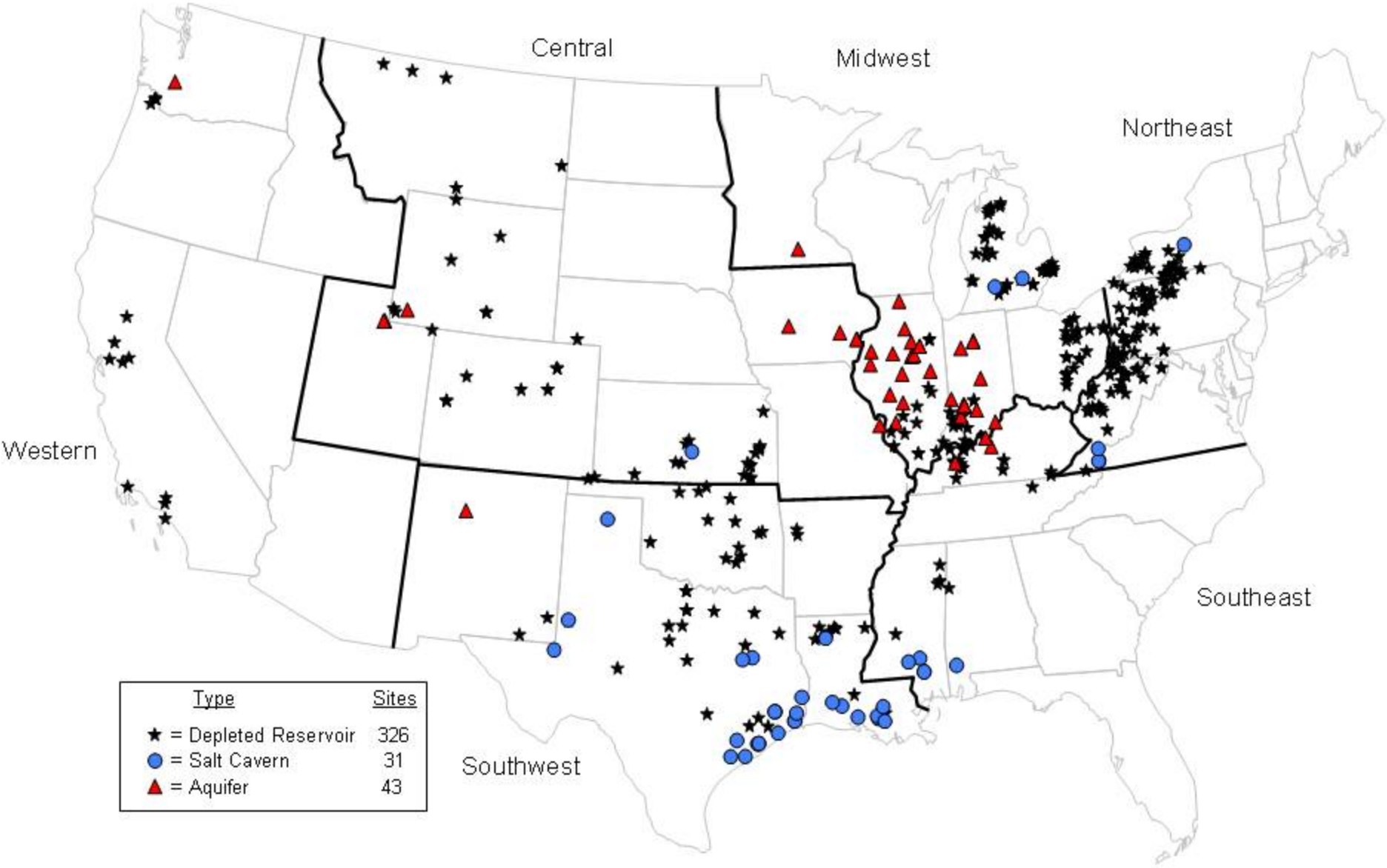
Transportation Process and Overflow

- Transporting natural gas from the wellhead to the final customer involves several physical transfers of custody and multiple processing steps.
  - A natural gas pipeline system begins at the natural gas producing well or field.
  - Once the gas leaves the producing well, a pipeline gathering system directs the flow either to a natural gas processing plant or directly to the mainline transmission grid
  - This depends on the initial quality of the wellhead product.
- The processing plant produces <u>pipeline-quality natural gas</u>. This gas is then transported by pipeline to consumers or is put into underground storage for future use.
- Storage helps to maintain pipeline system operational integrity and/or to meet customer requirements during peak-usage periods.


Legend
= Interstate Pipeline
= Intrastate Pipeline
= Compressor Station

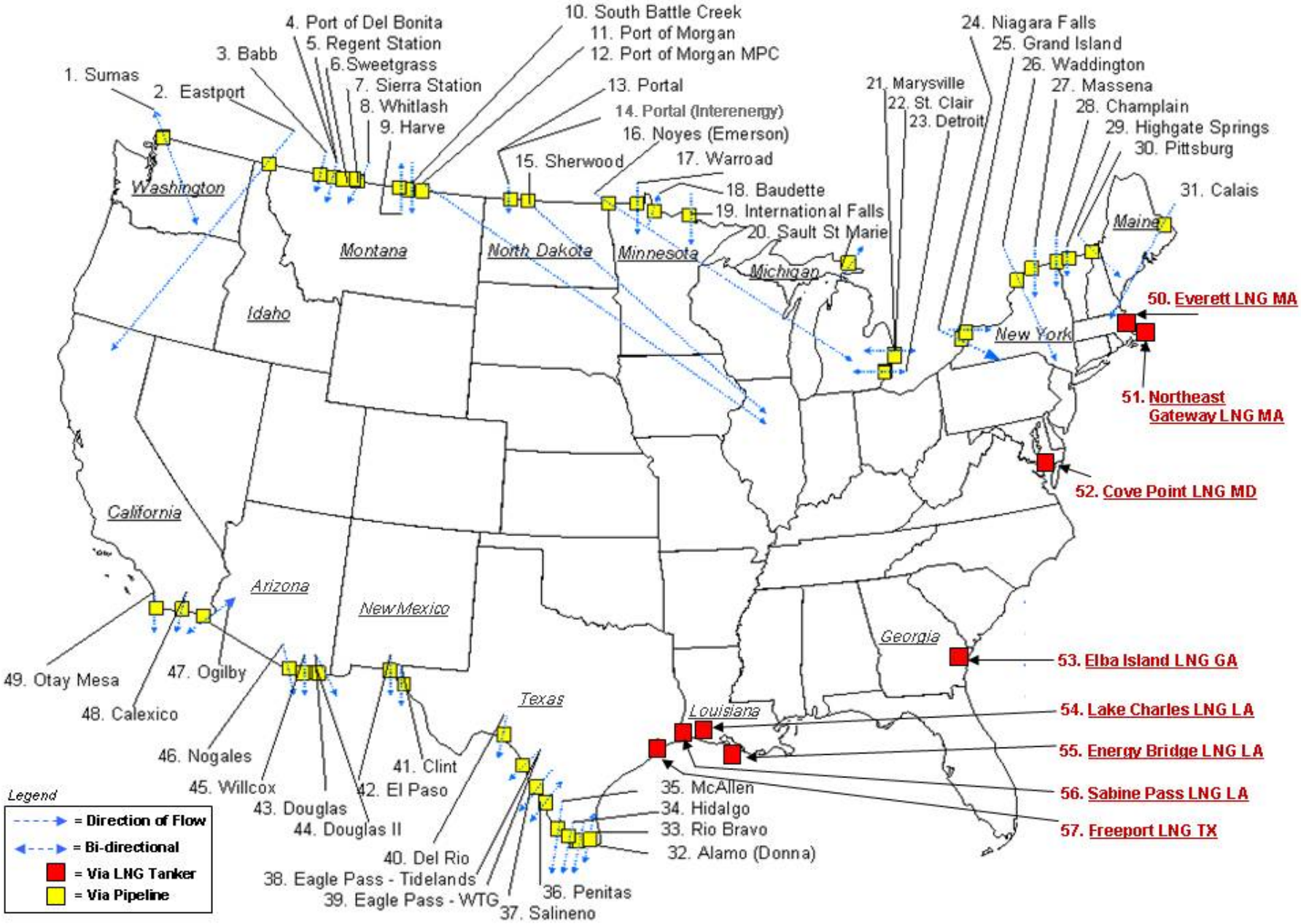
Natural Gas Market Centers and Hubs in Relation to Major Natural Gas Transportation Corridors, 2009

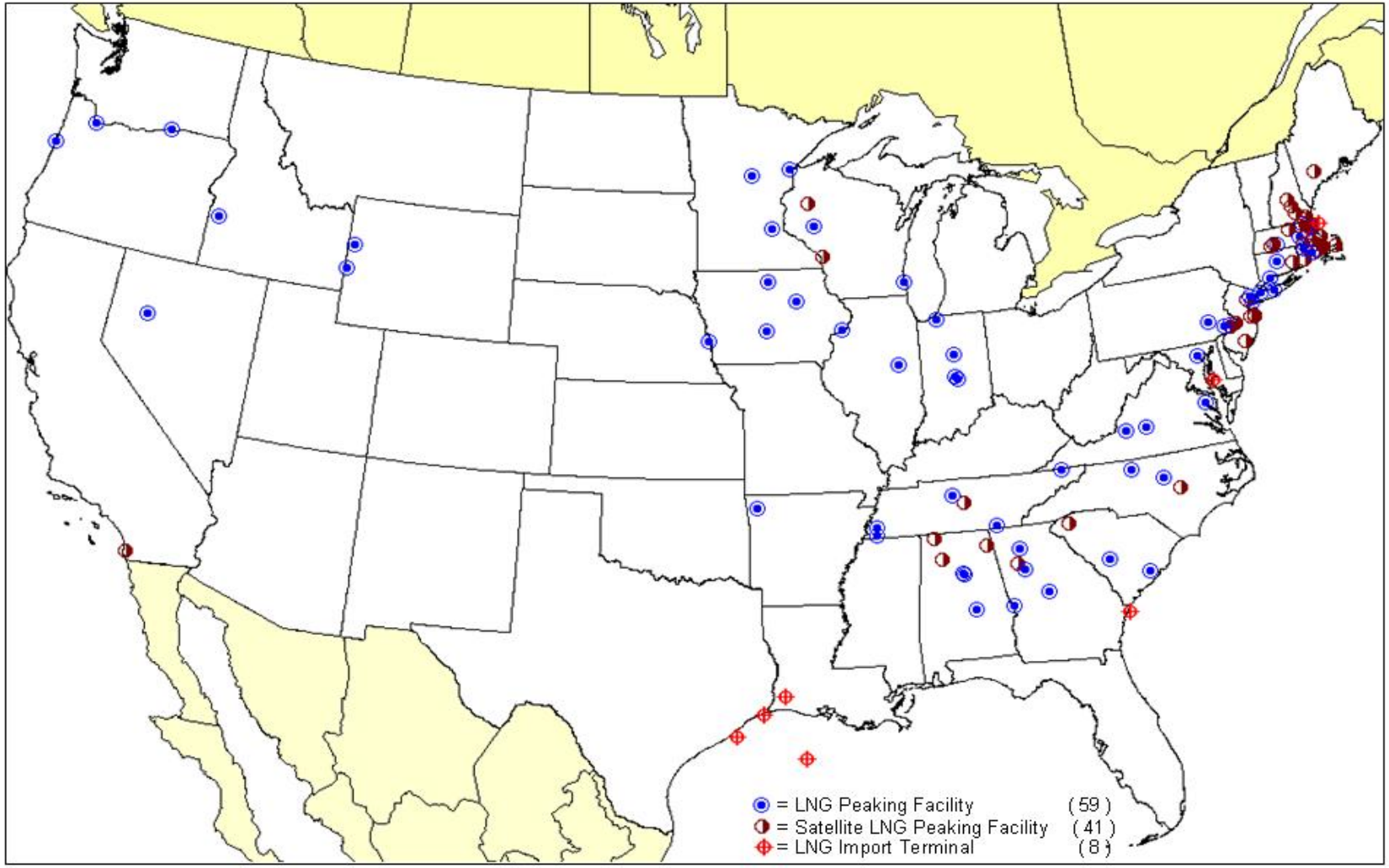




Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division Gas, Gas Transportation Information System, December 2008.

U.S. Natural Gas Import/Export Locations, as of the end of 2008





Note: Satellite LNG facilities have no liquefaction facilities. All supplies are transported to the site via tanker truck.
Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division Gas, Gas Transportation Information System, December 2008.