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ROADMAP FOR THE DEVELOPMENT OF DOWNSTREAM NATURAL GAS MARKETS

Asia Regional Energy Regulatory Partnership
October 2019 – September 2020

September 2020
This publication was produced for review by the United States Agency for International Development (USAID). It was prepared by the National Association of Regulatory Utility Commissioners (NARUC).

ROADMAP FOR THE DEVELOPMENT OF DOWNSTREAM NATURAL GAS MARKETS

LESSONS LEARNED FROM THE U.S.

ASIA GAS PARTNERSHIP
September 2020

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List of Acronyms or Abbreviations

AGP – Asia Gas Partnership

AGS – Alternative Gas Supplier

Asia EDGE – Enhancing Development and Growth through Energy

FERC – U.S. Federal Energy Regulatory Commission

FSRU – Floating Storage Regasification Unit

GCR - Gas Cost Recovery

GHG – Greenhouse Gas

HHI - Herfindahl-Hirschmann Index

ICC – Illinois Commerce Commission

IRP – Integrated Resource Plan

LDC – Local Distribution Company

LNG – Liquefied Natural Gas

NARUC – National Association of Regulatory Utility Commissioners

NYMEX – New York Mercantile Futures Exchange

RDMA – USAID Regional Development Mission for Asia

TPSO – Transmission Pipeline System Operators

USAID – United States Agency for International Development

USEA – United States Energy Association

WUTC – Washington Utilities and Transportation Commission

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1. Background

1.1. Natural Gas in Asia

In the context of global climate change and the widespread impetus on behalf of governments worldwide to transition their power sectors towards more sustainable generation portfolios, regional interest in using natural gas throughout Southeast Asia and the Asia Pacific has catalyzed the process of establishing initial regulatory frameworks and market components governing upstream, midstream, and downstream natural gas sector activities.

Natural gas for power generation, industrial production, commercial, and residential use is anticipated to help many Asian countries to achieve their respective policy goals of lower emissions, reduced air pollution and environmental benefits, greater generation efficiency, bridge fuel requirements, greater power reliability, cheaper electricity prices for consumers, system reliability and resiliency goals, and overall energy independence. As the fastest growing energy resource for decades, natural gas has become a commodity of great interest due to its high conversion efficiency for power generation, as well as its cleaner greenhouse gas (GHG) emissions profile relative to other fuel sources such as coal and oil. Liquefied natural gas (LNG) has become a convenient method by which natural gas is brought to market for countries without pipeline access to natural gas fields to use as a bridge fuel.

As a "bridge fuel", natural gas is considered a viable source to help buy more time to develop new technologies and other energy sources while still providing reliable base generation. Natural gas burns cleaner than coal or oil and has been considered the fuel of choice to replace U.S. coal-fired electric generation. Natural gas fired electric generation also helps support renewable resources like wind and solar, which are intermittent and do not generate electricity 24 hours a day, 7 days a week as is needed by consumers. Natural gas fired electric generation can help fill in generation gaps during which renewable resources cannot generate enough energy to meet all electricity demand, such as late hours in a day when the sun does not radiate sufficiently on photovoltaic panels.

In addition, natural gas fired generation has the ability to "ramp up" quickly compared with oil and coal, rendering natural gas the advantageous fuel – especially for instances in which renewable resources are variable and intermittent. As such, natural gas as a "bridge fuel" refers to the implication that countries will utilize natural gas as a generation fuel now, in order to achieve short-term greenhouse gas reductions by replacing coal-fired power – and subsequently reduce or end reliance on natural gas over some period of time to lock in long-term greenhouse gas reductions.

Indo-Pacific LNG Context

Asia has been and continues to be the world's largest importer of LNG, but the Indo-Pacific specifically is comprised of current and former natural gas producers as well as new or longstanding natural gas importers. While the region is diverse in this regard, a common interest has emerged in investing towards a long-term future with natural gas as a key component of the respective cleaner energy futures and economic development.

On one end of the spectrum, Indonesia has a long history with LNG as a leading global supplier, but the government has directed more of its domestic natural gas production to domestic use to accommodate growing demand for electricity and industrial consumption. Such a shift necessitates rethinking natural gas transportation infrastructure, which is a common issue in a region made up of 17,491 islands. One export facility in Indonesia was even converted into a receiving terminal. Despite abundant natural gas production, Indonesia has still required imported LNG to meet domestic energy needs.

Indonesia is very experienced with natural gas, while continuing to balance competing priorities. Moving forward, Indonesia intends to connect an additional four million households to city gas by 2024, marking a significant increase from the current statistic of roughly 537,000 connected households. This concept, expected to occur in countries throughout the region as downstream markets advance, presents significant opportunities for countries in the region to create additional downstream natural gas retail markets.

The Philippines, which is also an archipelago consisting of 7,641 islands, faces growing electricity demand accompanying industrial expansion and population growth. With natural gas anticipated to play a major role in the transition to efficient power generation and industrial needs, the Government of the Philippines has established the development of downstream natural gas markets as a nationwide priority. With the Malampaya gas field expected to reach depletion by 2024, the country has accelerated steps towards constructing floating import infrastructure needed to process impending LNG imports from international trade partners. In previous years, the Philippines has also considered developing a natural gas pipeline for power generation and non-power use.

Thailand and Vietnam have had established natural gas markets for decades, and continuous demand growth far outweighs any current or planned domestic production. As such, Thailand and Vietnam have devoted their governments to thoughtfully developing their respective energy strategies with increasing reliance on natural gas to meet consistent demand growth. For example, Vietnam outlines these strategies in its Gas Master Plan and its broader Power Development Plan V. 7, which meticulously lays out anticipated demand and the national energy strategy (Thailand produces a similar Power Development Plan).

On the other hand, Papua New Guinea (PNG) is a newcomer to natural gas and continues to build from scratch. PNG began exporting LNG in 2014, and LNG already represents a major share of national exports. Natural gas is not currently part of the national electricity generation mix, but the government is working towards incorporating gas as a transition fuel as it works towards expanding electricity access and achieving its ambitious plan to transition to full reliance on renewable energy sources.

Having progressed rapidly in natural gas production and imports, Bangladesh has established its position as a large natural gas producer; with two operational LNG facilities including a Summit LNG floating storage regasification unit (FSRU) and an Excelerate Energy FSRU (both operating under capacity), the country has imported LNG resources since 2018 to help meet domestic electricity demand and alleviate strains on its power grid to reduce blackouts. Additional gas pipeline connectivity and expansion of regasification capacity are expected to boost LNG imports moving forward.

As demonstrated by the experience of these and other countries in the region, there are many factors to evaluate in each individual context when considering supplementing with LNG imports. Apart from the obvious sensitivities to price stability and infrastructure cost, each national context requires thoughtful and comprehensive consideration in deciding if LNG imports accomplish national energy goals in the short or long term. Geography, economic development, and the environment are all important considerations for the attractiveness of LNG imports. Long-term planning that factors in stated priorities and educated assumptions about future domestic production and demand, as demonstrated in the Vietnam and Thailand examples, are a model for this type of transparent strategy.

Natural Gas and Renewable Energy Sources

In order to meet the challenges imposed by sustained economic growth, energy continues to be a major development focus for each of these countries. At the same time, while economic and political pressures demand that new investments deliver least-cost energy, many in the region are devoting substantial portions of their national energy strategies to renewable energy (RE). For example,

Vietnam, Thailand, Sri Lanka, Papua New Guinea, and the Philippines all prioritize RE composing a significant and growing share of their energy portfolios. Recently, Indonesia has been drafting legislation to follow this trend,[1] and Bangladesh continues to develop RE projects as a component of its sustainable energy goals.

The need for developing plentiful least-cost energy while at the same time expanding the share of RE in the respective national energy mix demonstrates why the Indo-Pacific maintains key interests in natural gas. Natural gas offers several advantages that have caused it to take root in the region. As a source of electricity generation, natural gas is more efficient and less environmentally harmful than other fossil fuels. And, perhaps just as importantly, natural gas is incredibly effective in ensuring grid stability while paired with renewable sources such as solar and wind generation due to its relative quickness and efficiency in ramping up and down.

Natural gas electricity generation often goes hand-in-hand with renewables due to its capabilities in balancing production when intermittent and seasonable renewable energy sources (such as solar power and hydropower, respectively) aren't able to meet peak load demand. As such, natural gas-to-power can help Indo-Pacific countries meet growing electricity demand while helping to reduce climate change impacts from their power generation portfolios.

Natural Gas Pricing

As a market commodity, natural gas has fallen in price, largely due to hydraulic fracturing techniques and the associated boom in U.S. production and export. Hydraulic fracturing (also informally known as "fracking") is an oil and gas well development process of injecting water, sand, and chemicals under high pressure into a bedrock formation via a given well. This process is designed to create new fractures in the rock as and increase the size, extent, and connectivity of existing fractures. Hydraulic fracturing is a well-stimulation technique used commonly in low-permeability rocks like tight sandstone, shale, and some coal beds to increase oil and/or gas flow to a well from petroleum-bearing rock formations. A similar technique is used to create improved permeability in underground geothermal reservoirs.[2]

Indeed, as natural gas markets have grown, prices have become more sophisticated and independent, along with a relative "decoupling" from the geopolitics of oil prices. This has included a move from spot gas prices being indexed to oil to a gas-on-gas index that softened price volatility. Together with deregulation and increasing output—most notably from the U.S.—natural gas prices are far more stable and have been consistently trending downward over the last 20 years.

Many notable occurrences have influenced the U.S. natural gas market over the past 30 plus years. The NYMEX natural gas future contract came into existence in 1990, providing the ability to hedge natural gas purchases. Various open access rules associated with natural gas exploration, delivery and transportation were issued in 1980s and early 1990s. The past 30 years has also seen the construction of several major interstate transmission pipelines as well as a significant increase in the amount of storage available to various parties.

The 1990s also saw a significant increase in customer choice programs, especially for the larger customers; the past 15 to 20 years have seen an extension of choice to residential customers. In the last 10 years, hydraulic fracturing has greatly increased the overall supply of natural gas and ultimately

[1] Basten Gokkon. "In Indonesian Renewables Bill, Activists see Chance to Move Away from Coal." Mongabay. February 2020. https://news.mongabay.com/2020/02/indonesia-renewable-energy-bill-coal/#:~:text=Indonesia's%20energy%20policy%20calls%20for,the%20installation%20of%20rooftop%20solar.&text=Image%20by%20Tommy%20Apriando%2FMongabay%20Indonesia

[2] "What is Hydraulic Fracturing?" U.S. Geological Survey. https://www.usgs.gov/faqs/what-hydraulic-fracturing?qt-news_science_products=0#qt-news_science_products

led to a LNG export market for the U.S. Various technological advances have also allowed companies the ability to earn a positive margin as natural gas prices have fallen. The combination of these factors and more has transformed natural gas from what was once considered a "somewhat byproduct of oil production" to a commodity with its own sophisticated market.

Some countries in the Asia Pacific region present exceptions to the downward natural gas pricing trend. In Indonesia, for example, natural gas prices are largely and historically driven by long-term LNG contracts with a price formulation tied to oil price indices. Indonesia also has domestic market obligations applied for the oil and gas sector, by which producers have to allocate a certain portion of their production for domestic markets at a price range determined by the government. This policy is intended to support domestic use of natural gas to drive local industry growth in Indonesia. To the extent a country also has natural gas production, longer-term contracts may have to be tied to a particular country's own pricing constructs.

For countries with similar concerns regarding natural gas pricing, there are different ways to structure LNG contracts and natural gas price benchmarking, such as establishing pricing mechanisms that tie gas future contract pricing to locational natural gas hubs (referred to as zone pricing) instead of oil prices. Another natural gas contract pricing structure (often for shorter-term contracts) in the U.S. combines 1) NYMEX (New York Mercantile Exchange) commodity futures exchange pricing for the gas commodity based on natural gas prices at the Henry Hub zone in Erath, Louisiana, with 2) Basis[3], which is the regional differential to the NYMEX price.

The depressed economic demand due to the COVID-19 pandemic also has added downward pressure to natural gas prices. Natural gas commodities have seen a decline in demand during the transformative pandemic, a result of steep declines in commercial and industrial use as well as widespread business closures. In June, the Henry Hub spot price dropped 12 cents/Million British Thermal Units (MMBtu) from the previous month and marked the lowest (inflation adjusted) monthly average price in the last 40 years. The decreased demand is leading to increasing cargo cancellations and pooling LNG storage reserves in the U.S., Europe, and Asia, despite the low prices and decrease in drilling activity. According to the U.S. Energy Information Administration (EIA), U.S. LNG exports declined by 17% between April and May. As of August 2020, EIA expects these exports to rebound in September and regain pre-COVID levels towards the end of 2020.

In the U.S., several aspects of utility operations and customer debt/assistance have been impacted by the COVID-19 pandemic. For example, Washington State's regulated utilities are required to follow strict protocols for workers in the field including health screenings before reporting to work, partnering with other crew members they normally work with to limit interactions, and wearing personal protective equipment. These protocols have led to higher than budgeted costs for utilities. Besides operations, utilities initially suspended customer disconnections, late fees and penalties on a voluntary basis and have continued those practices through a state government mandated moratorium on disconnections for non-payment.

The regulator has monitored those practices and approved new or expanded low-income/pandemic caused customer bill assistance programs. The state regulator has also convened utilities and other stakeholders to discuss plans for how to handle customer bill assistance after state government mandated disconnection moratoriums end. These crucial regulatory considerations should be considered by regulators worldwide in the face of the pandemic.

[3] A basis represents the difference in pricing from the NYMEX physical location (Henry Hub) and other locations within the transportation system.

1.2. Natural Gas Markets in the United States

In April 1992, the U.S. Federal Energy Regulatory Commission (FERC) issued Order 636 to transform U.S. natural gas transportation, requiring gas pipeline companies to restructure operations and split off any non-regulated sales activities from their regulated transportation activities. This reform subsequently restricted gas pipeline companies to the transport of natural gas for their customers, thus "unbundling" gas production from transmission, transmission from storage, and transmission from sales to enhance market competition, diversity, and price transparency.

Throughout the transformation of its natural gas sector, the U.S. implemented orderly and gradual reforms to successfully transition the sector into competitive, liberalized markets through a gradual deregulation process. Today's natural gas market structure in the U.S. entails and is characterized by high levels of competition between numerous entities in downstream market areas such as wholesale and retail gas sales. Various uses of natural gas include power generation, industrial production, and commercial and residential applications. It is this healthy level of robust competition that is conducive to lower prices for natural gas products – an outcome of interest for natural gas regulators and consumers.

In the final market stage of the natural gas chain, competitive and fluid downstream natural gas markets are distinguished by unbundled services, competitive wholesale and retail prices, diversified participants, diversified marketing and distribution, and open, non-discriminatory access to integral infrastructure such as LNG import terminals, downstream distribution pipelines, and storage facilities.

An ideal regulatory framework governing a country's downstream natural gas sector should efficiently facilitate the unimpeded operation of market forces to stimulate production of natural gas, thereby contributing to reduced dependence upon imported foreign oil and coal. This in turn helps to cultivate availability of clean-burning natural gas for the purposes of addressing environmental issues, provide cleaner bridge fuels, and secure long-term pillars of electric generating capacity.[4] Downstream natural gas regulatory frameworks are subject to overarching policy objectives of the respective country, including macroeconomic considerations, level of energy sector and regulatory development, local capacity-building, and energy security circumstances.

To accomplish these objectives, all gas purchasers, including local gas distribution companies and end users (such as gas-fired electric generators), should have the ability to make market-driven choices about natural gas prices as a commodity as well as the cost of gas delivery. The FERC contends that efficiency in national gas markets is realized when purchasers of gas commodities know the prices of the distinct elements associated with the full range of services needed to deliver gas from wellhead to end use.[5]

Full transparency of total pricing for end users entails a successful, fair gas marketplace. This result is the ultimate goal of energy regulators overseeing the creation of and/or transition to functional, competitive downstream natural gas sectors in order to provide the best gas products at fair prices to their countries' consumers.

1.3. Asia EDGE

Asia EDGE—Enhancing Development and Growth through Energy – is a U.S. whole-of-government initiative to grow sustainable and secure energy markets across the Indo-Pacific region and level the playing field for private sector firms in Asia. Under Asia EDGE, the U.S. Agency for International

[4] "ORDER NO. 636 - RESTRUCTURING OF PIPELINE SERVICES." FERC. https://www.ferc.gov/order-no-636-restructuring-pipeline-services
[5] Ibid.

Development (USAID) supports partner countries to mobilize private investment, modernize technologies and practices, and expand market opportunities to accelerate the growth of the region's energy markets in four key areas: (1) Regional Energy Trade and Integration; (2) Increased Deployment of Advanced Energy Systems; (3) Utility Modernization; and (4) Transparent, Best Value Procurement.

1.4. Asia Gas Partnership

Under the auspices of USAID's Regional Development Mission for Asia (USAID/RDMA) and in support of the Asia EDGE initiative, the National Association of Regulatory Utility Commissioners (NARUC), together with the U.S. Energy Association (USEA), is engaged in the Asia Gas Partnership (AGP) Program to establish a public-private partnership involving government and industry representatives from the U.S. and Indo-Pacific countries.

The objective of the AGP is to share best practices in the development of secure, reliable, and economic regulatory frameworks governing natural gas sector development while facilitating investment and regulatory advancements in the energy industry - to ultimately stimulate gas demand growth by optimizing gas network infrastructure development and developing domestic gas markets in Asia.

2. Introduction to the *Roadmap* and Preliminary Considerations in the Development of Downstream Natural Gas Markets

2.1. Purpose of the Roadmap

NARUC created the *Roadmap for the Development of Downstream Natural Gas Markets (Roadmap)* and corresponding infographic tool to share through the AGP Program as an informative step-by-step reference for energy regulators and energy sector decision makers in countries introducing LNG imports and subsequently overseeing domestic regulation of nascent downstream natural gas markets. The *Roadmap* outlines the key foundational tenets governing the structure of well-functioning, competitive downstream natural gas sectors as exhibited through best practices gleaned from the establishment of liberalized natural gas sector and market reforms in the U.S.

This document identifies recommended key regulatory steps, provisions, and considerations necessary to establish diversified and competitive downstream gas sectors in countries integrating imported LNG resources. Note that the *Roadmap* will be used as a guide in driving the discussion on regulatory requirements for establishing robust downstream natural gas markets under AGP. The *Roadmap* is not meant to be a one-size-fits-all approach, but rather a resource that provides steps for consideration in establishing robust downstream natural gas markets, based on historical progress and current practices in the U.S.

While this *Roadmap* is derived from U.S. regulatory experiences and broader international best practices in downstream natural gas market formation and regulation, each country should establish its own specific sector goals and the regulatory, economic, and commercial mechanisms needed to achieve them in order to properly develop a robust natural gas market. This objective entails convening all relevant stakeholders in order to agreeably define broad strategies and address issues such as the economic, political, commercial, and environmental reasons for pursuing natural gas resources as well as the development of projected gas demand (volume and geography) and anticipated generation sources over time.

The decision makers in each country also need to consider required political conditions to execute these goals, such as establishing international trade alliances and anticipated gas suppliers. Any such plan for pursuing the creation of a natural gas market should contain this detailed, deliberate, and inclusive decision-making process, addressing the key regulatory provisions assessed throughout this *Roadmap*. Building a clear and thoughtful strategy by convening a broad group of government and industry stakeholders from nascent stages is a best practice that has been undertaken by several countries in the Indo-Pacific, effectively setting the stage for successful policy implementation.

2.2. General Considerations in Developing Downstream Natural Gas Markets

Before setting out to develop a downstream natural gas market, decision makers in each country need to take into consideration the overall structure and context of the natural gas sector in their respective countries and regions as well as globally.[6] This includes considerations such as identifying the most technically and economically adequate sources of natural gas, evaluating demand for natural gas, identifying the locations of demand centers,[7] and discerning how natural gas will be transported from the extraction centers or receiving terminals to demand centers.

2.2.1. Natural Gas Resources

Depending on respective geographical circumstances and trade alliances, a country without onshore or offshore gas reserves can either import natural gas via a pipeline from a neighboring country or by vessel in the form of LNG. In some circumstances, countries can import natural gas through both pipelines and LNG cargoes. For example, China, Turkey, and several European countries import natural gas through pipelines *and* LNG cargoes. To the opposite extreme, natural gas-producing countries like the U.S. import natural gas through pipelines and LNG while simultaneously exporting LNG. For countries interested in prioritizing LNG imports moving forward, a crucial first step is developing and facilitating an import market.

2.2.2. Preliminary Considerations

In order to properly develop a robust natural gas market, the government has to establish certain goals and the mechanisms to achieve them. Prior to entertaining the idea of a regulatory regime for natural gas consumption, governments and regulators must conduct a thorough analysis and review of respective goals in order to identify and establish the parameters precedent for the development or expansion of a natural gas market. Key considerations should include:

- potential demand among various market sectors, including gas to power use, commercial/industrial production, household cooking, cooling and heating, and vehicle use;
    - opportunities that various types of market demand can open up for a country's business venture prospects
- where the initial demand with anchor customers is;
- whether to establish government-owned or private and commercial regimes;[8]

[6] Aside from the U.S., Europe (specifically, the European Union) is a primary example of a country or region with a sophisticated, liberalized natural gas system.

[7] In the U.S., a demand center (also known as the market area) may have both customer loads as well as storage in close proximity.

- whether the conditions precedent for developing a natural gas market exist, or must be established by government action pertaining to:
    - environmental laws
    - ability to incentivize the development of the market through various policy drivers
    - whether the economy can support conversion from current generation fuels to natural gas
- what the regional potential for expansion is; and
- how to develop an appealing import market.

Establishing whether the downstream natural gas industry is comprised of government-owned entities or authorized private commercial actors is a *significant* determinant of downstream policy, financial considerations, and diversified international investment in the sector. A government's decision to open up the natural gas sector to international investors, developers, marketers, and consumers signals to these potential players that the country is welcoming to investment to grow and strengthen its burgeoning natural gas industry.

Additionally, it is important to note that regional expansion prospects are subject to change; there is a key need to assess long-term forecasting and adjustments as demand may fluctuate up and down in response to global events upsetting projections, such as the COVID-19 pandemic and its effects on markets, resources, and energy demand.

Following analysis of these desired parameters informing the gas market, governments should conduct feasibility studies and plan the downstream natural gas market structure, considering the following key questions:

1. Will the market be primarily privately owned, government owned, or represent a combination of both private and public ownership?
2. Will a single provider perform import, storage, transportation, and delivery functions of the commodity to end users?
3. Will there be distinct differentiation between the importer, storage facility, the transporter, and the retailer through unbundled functions?
4. Will there be more than one importer?
5. Will there be a single storage facility or a variety of facilities?
6. How will natural and human-induced hazards be considered and accommodated in the natural gas value chain?
7. What types of contract structures will govern capacity transactions between service providers and pipelines?
8. If the country decides upon importing LNG resources, will the government encourage and incentivize the development of regional import/storage facilities, and would the government support an interconnected network (assuming geography permits)?

For instance, the island nation of Jamaica has begun LNG imports to fuel gas-powered electricity. Once the infrastructure has been established, importers will consider the next step of expanding natural gas sales to commercial customers. For importing nations without economically viable domestic resources, the natural gas market will have three fundamental elements: (1) the point of import, (2) pipeline transportation to large customers and generators, and (3) delivery to retail customers. Because the costs associated with developing necessary infrastructure lead to a limited number of participants, each of these elements/steps requires specific levels of regulatory supervision.

Large consumers may buy their own gas on the world market and contract for delivery. As for mass market retail gas customers, the regulator would have to design delivery rates (transmission, storage and distribution) based on the fixed charge for delivery (cost +). There are two choices for the commodity charge for mass market customers: 1) if retail competition is available, mass market

customers contract with suppliers for a commodity price, and 2) if there is no retail competition, the regulator would develop what is called a Gas Cost Recovery (GCR) charge. The latter is basically the cost that the local distribution company (LDC) paid on behalf of its end users to buy the gas. The LDC generally does not make any money on the gas commodity. It is simply a pass-through cost, although in some cases regulators may opt to permit a margin.

Although these respective manners of regulatory supervision are conducted in a similar fashion, they are not identical. For instance, large generating facilities or large LDCs can usually leverage financial strength and market power against monopolistic pricing if it is attempted by LNG storage facilities or domestic pipelines. Without regulatory oversight, it is rare for smaller generators or LDCs to fight monopolistic pricing and behavior. Similarly, once a retail customer has been connected to the LDC and invested in natural gas-fired equipment, the customer becomes what is referred to as a "captive customer." Regulatory oversight is essential for ensuring that LDCs behave in a manner similar to a company operating in a competitive environment.

2.2.3. Natural Gas Transportation and Delivery

In the U.S., pipeline transportation of gas is referred to as interstate transportation. The downstream sector implies the trajectory of natural gas from the production/import point of receipt to power generators, industrial customers, gas suppliers, and local gas distribution companies. Developing the infrastructure for downstream gas transportation requires significant financial investment, a clearly defined natural gas transmission infrastructure market, and a guarantee that the investment will prove profitable over the long term.

Overseeing natural gas delivery to retail customers is the final level of regulatory overview for the downstream gas sector. As a regulated monopoly, a LDC must be subject to regulatory oversight of rates, customer services, and safety practices in order to ensure that the captive retail customers are not subjected to monopolistic pricing for distribution service. Regulatory oversight is an embodiment of the normal compact between energy regulators and those they regulate; it is a core and important aspect of the regulatory body to ensure that the right regulatory oversight and relationship is established in order to effectively preside over regulation of the sector.

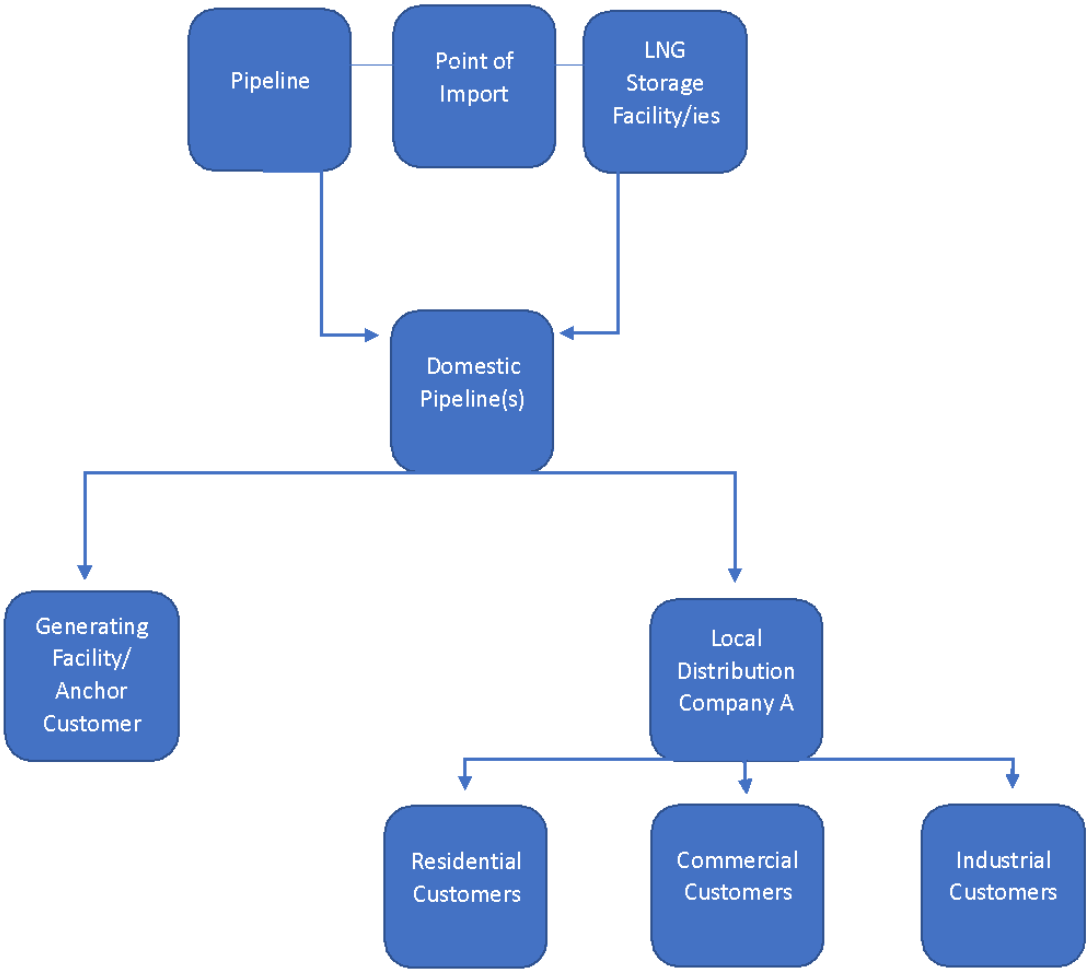
At a Glance: **Transport/Processing of Natural Gas from Wellhead to End Users**

Gas Production at Wellhead ➔ Low Pressure Gathering Lines ➔ Processing Centers [9] ➔ High Pressure Transmission Pipelines ➔ [10] Storage or City Gate ➔ Low pressure Local Distribution Lines ➔ End Users

[9] Raw gas is transformed into different products; such as liquefied butane or propane for heating and cooking, and transportation, or into commercial-grade natural gas for delivery to end users.

[10] The following steps are inserted at this point if transporting LNG: LNG Export Terminal (chilled to liquid) ➔ Shipped (via tankers) ➔ LNG Import Terminal (heated or re-gasified) ➔

Figure 1: Downstream Natural Gas Chain



Source: Andreas Thanos, Massachusetts Department of Public Utilities

3. Downstream Natural Gas Market and Formation Roadmap

The *Roadmap* is organized depicting the order in which regulatory and policy reforms required to formulate downstream natural gas sectors should be implemented, beginning with *Necessary Steps for Regulatory Reform – Establishing Incentives for Investing in Natural Gas Infrastructure*. This section explores the initial regulatory reforms and steps required to establish foundations of downstream natural gas markets and incentivize investment in downstream infrastructure.

The following section, *Day 0 - Wholesale Market,* discusses the key regulatory and market provisions in place to encourage open access to downstream natural gas transmission and storage infrastructure, as well as unbundled or separated operations to incentivize competition and innovation over time as the sector matures. *Day 1 – Transmission Pipeline Capacity & Contracts*, delves into pipeline transmission capacity, contract options, and platforms required for trading transmission pipeline capacity.

Lastly, *Day 2 – Retail Market*, discusses the final stages of competitive downstream natural gas markets including open access to local gas distribution infrastructure, cultivating competition at the local distribution level, transparency, and uniformity among licensing/certification application and review processes. Each tenet of these regulatory steps is discussed below, ultimately comprising an effective *Downstream Natural Gas Roadmap* consisting of the key regulatory steps and best practices that have characterized the successful formation of and transitions to competitive downstream natural gas sectors.

The symbolic Days (0, 1, and 2) and the steps within them are created to portray an advisable – yet noncompulsory – pathway toward liberalized, competitive, and efficient downstream natural gas markets. A country may skip a step or two and move from the steps in Day 0 to Day 1 or to Day 2. However, it is advisable to revisit the missing steps at a later time to ensure further and comprehensive progress.

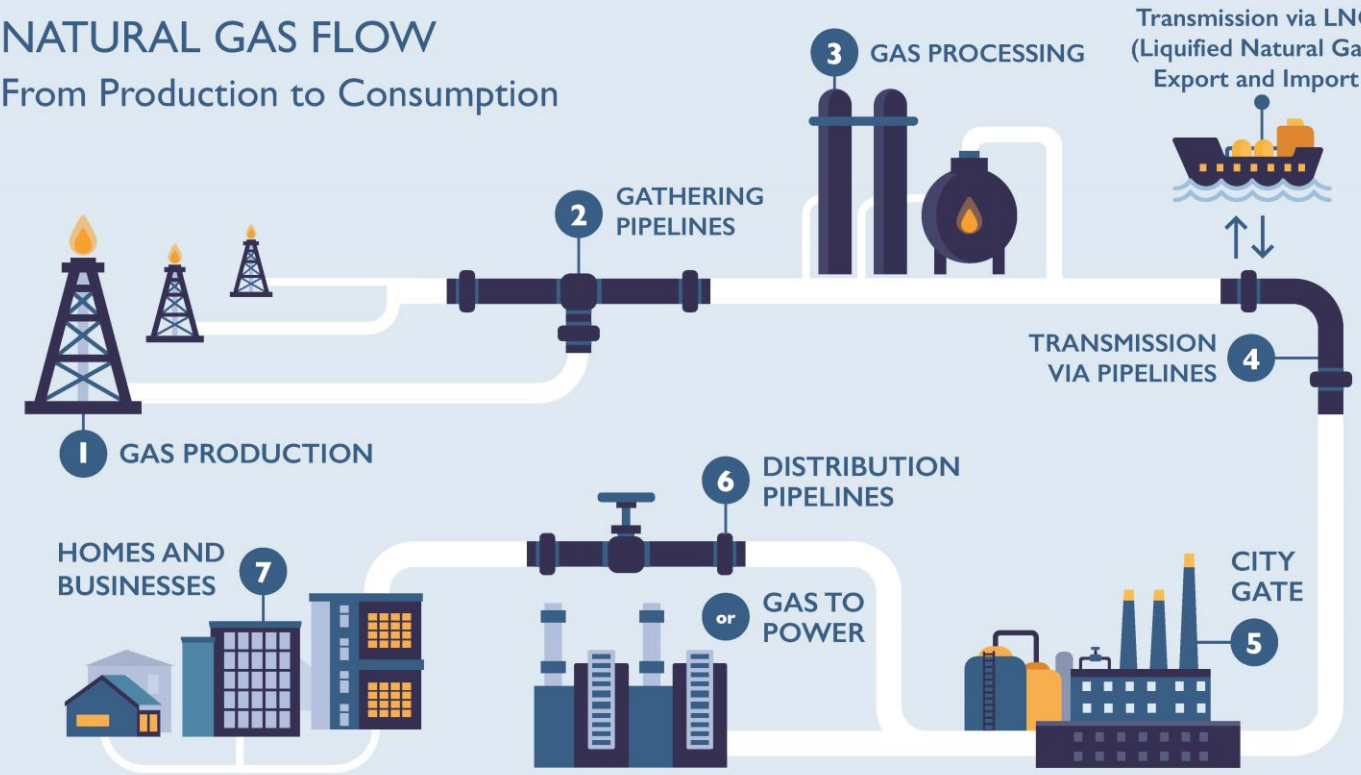
Anticipated timeframes required to establish each stage of downstream natural gas market development are provided for Days (0, 1, and 2). For the preliminary premises established in *Section 3.1. Necessary Steps for Regulatory Reforms* below, an anticipated timeframe for achieving these key regulatory tenets is dependent upon the starting baseline point at which a respective energy regulator's regime begins initiating the identified reforms. As such, establishing the preliminary regulatory steps identified in *Section 3.1* may span across a varying timeframe dependent upon the existing regulator's stages of capacity establishment.

DEVELOPING NATURAL GAS

INFRASTRUCTURE & MARKETS

NATURAL GAS FLOW

From Production to Consumption



Steps for Regulatory Reforms

Infrastructure Investment Incentives

- Cost/benefit analysis and risk assessment
- Regulatory certainty
- Transparent and consistent review, approval, and licensing process
- Long-term demand forecasts

Developing Wholesale and Retail Natural Gas Markets

Day 0: Getting Started with a Wholesale Market

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- Clearly Defined Retail Supplier Certification Process (Financial, Technical, and Managerial Capability)
- End Users' Choice of Retail Suppliers and Contract (Price/Term) Type
- Retail Market Monitoring and Mitigation against Anti-Competitive Marketing Practices

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3.1. Necessary Steps for Regulatory Reforms – Establishing Incentives for Investing in Natural Gas Infrastructure

Section 3.1 explores the initial regulatory reforms and steps required to establish foundations of downstream natural gas markets and incentivize investment in downstream infrastructure.

- *Regulatory Certainty*
    - Among the most important attributes of tenable investment environments for a respective country's gas sector are definite levels of regulatory certainty and responsiveness, an apolitical and independent regulator, and cost-reflective pricing mechanisms in place to ensure cost recovery on investments.

    - Prospective investors and operators in the downstream gas sector are far more inclined to pursue infrastructural and operational investment if regulatory and financial provisions provide cost recovery certainty for assets and capital invested. Additionally, regulatory frameworks should address *eminent domain* concerns in order to reassure developers that the country's government will not expropriate infrastructural assets without notice and compensation. Establishing an eminent domain provision is important to assure investors and developers that a gas transporter maintains the right to perform necessary construction of infrastructural alterations, additions, extensions or improvements, to ultimately maintain safe pipeline infrastructure for the public interest.[11]

- *Clearly Defined Review/Approval Process for Long-Term Network Development Plans*
    - All information that should be included in a network development plan needs to be clearly defined. The regulatory approval process for proposed long-term network development must also be clearly defined and transparent, such that entities proposing development projects know what documentation and informational components are required for the regulator's full review and assessment.

    - For example, if a regulator requires submission of a full integrated resource plan (IRP) that includes infrastructure and other supply considerations to accommodate forecasted demand growth over a proposed build-out period, the regulator must clearly define the technical requirements needed for evaluation of infrastructural development proposals – and the regulator must define timelines for review and approval processes.
        - For countries with nascent natural gas sectors, energy regulators should formulate and adhere to natural gas sector development policies, such as a gas utilization master plan. These broad-spectrum market plans should be prepared as national efforts by policymakers and regulators, as LDCs in may not have the capacity to develop natural gas IRPs. Regardless of which entity devises a natural gas network development plan, the general components of natural gas network development plans still apply.

    - In the U.S. state of Washington, the Washington Utilities and Transportation Commission (WUTC) reviews IRPs submitted by gas LDCs, and writes an

[11] Northern Illinois Gas Company d/b/a Nicor Gas Company Petition for Order pursuant to Sections 8-503 and 8-509 of the Public Utilities Act Authorizing the Use of Eminent Domain Power. Illinois Commerce Commission. October 2018. https://www.icc.illinois.gov/docket/P2018-1632/documents/278360

acknowledgment letter confirming that the LDC's IRP has been compiled meeting state law requirements. The WUTC also provides comments on information needed in related future documentation. [12] Appropriate timelines for IRPs/network development plans (which include infrastructure and other supply considerations over a given period) should be determined at the discretion of the regulator if it has the authority to establish assessment periods.

- *Open and Transparent Process for Granting a Certificate of Public Convenience and Environmental Assessment*
    - Typically, no public utility shall begin the construction of any new plant, equipment, property or facility which is not in substitution of any existing plant, equipment, property or facility or any extension or alteration thereof or in addition thereto, unless and until it shall have obtained from the regulatory Commission a certificate that public convenience and necessity require such construction.[13]

    - The regulatory commission shall determine that proposed construction will promote the public convenience and necessity only if the utility demonstrates that:
        - the proposed construction is necessary to provide adequate, reliable, and efficient service to its customers and is the least-cost means of satisfying the service needs of its customers, or that the proposed construction will promote the development of an effectively competitive electricity market that operates efficiently, is equitable to all customers, and is the least cost means of satisfying those objectives;

        - the utility is capable of efficiently managing and supervising the construction process and has taken sufficient action to ensure adequate and efficient construction and supervision thereof; and

        - the utility is capable of financing the proposed construction without significant adverse financial consequences for the utility or its customers.[14]

    - The presiding government authority responsible for granting certificates of public convenience (the environmental regulator, health agency, siting regulator, or natural resource agency) should design a transparent process to determine public convenience and necessity of applications for construction or extension of natural gas facilities used for the sale or transportation of natural gas. Applications should establish "need" for projects, market demand, identify route selections, address environmental influences through environmental impact studies, and identify the projected cost and rate design.

    - If such applications are approved in the U.S., they are granted through an official Certificate of Public Convenience and Necessity. This approval authorizes building

[12] "2018 Integrated Resource Plan." Cascade Natural Gas Corporation. December 2018. https://cngc.com/wp-content/uploads/PDFs/IRP/2018/finals/2018-WA-IRP.pdf
[13] "Illinois Compiled Statutes." (220 ILCS 5/8-406) (from Ch. 111 2/3, par. 8-406)Sec. 8-406. Certificate of public convenience and necessity. Illinois General Assembly. https://www.ilga.gov/legislation/ilcs/fulltext.asp?DocName=022000050K8-406#:~:text=Whenever%20after%20a%20hearing%20the,of%20public%20convenience%20and%20necessity.
[14] Ibid.

operations per the conditions and specifications explicitly included in the regulator's approved certificate. Regulators must establish clear application and review processes, requirements, and key factors for evaluation among certificate applications. Said factors evaluated for applications should include market demand, environmental impact and safety, and illustration of public convenience and necessity for construction or extension of natural gas facilities. Gas companies typically file petitions with the regulatory commission to install, operate, and maintain natural gas distribution facilities, as well as transact public utility business within a given jurisdiction.

  - For example, Dakota Access, LTD submitted an "Application for Certificate in Good Standing and Other Relief" to the Illinois Commerce Commission (ICC) seeking approval to both construct and operate a common carrier petroleum pipeline, as well as to acquire land rights for construction.[15] The pipeline company's filling with the ICC for the proposed project included a primary application for pipeline construction, accompanied by official exhibits to the application providing pertinent required information for the Commission's assessment. This information included project route maps, an energy transfer system overview map, a preliminary list of required permits and approvals for the project, and a list of anticipated affected landowners, among others.

- *Effective Assessment of the Reasonableness of the Long-Term Demand Forecasts*
  - Long-term gas network planning proposals must include long-term demand forecasts and market interest; these demand forecasts are modeled by a number of available national modeling systems or proprietary models.[16] Major inputs include market growth assumptions including alternative fuel displacement, anticipated changes in resource supply growth, and current and future pipeline infrastructure. Modeling should also capture future "price basis blowouts" reflecting stranded supply or insufficient capacity to meet demand.

  - As for LNG development planning, it would be to the benefit of the developer and the market to share LNG development expansion plans for two reasons: 1) to ascertain whether there is an actual need for the expansion (versus a temporary increase in utilization), and 2) to allow the market to make decisions for the future, such as expansion of distribution systems, construction of natural gas-fired generation, and others.

- *Consistency in evaluating network upgrade projects for reliability, network expansion projects for economic growth, and inter-regional projects for common interest*
  - Regulatory commissions should establish firm, publically available criteria by which they evaluate proposed gas infrastructural network upgrade projects. Key commission considerations include the age of the infrastructure requiring upgrades, economic conditions that can affect the ability of the LDC to recover costs, system reliability, safety, environmental benefits, and customer requests.[17] Additionally, to assess

[15] "Document for 14-0754." Illinois Commerce Commission. December 2014. https://www.icc.illinois.gov/docket/P2014-0754/documents/223092

[16] "Review of Natural Gas Models." U.S. Energy Information Administration. September 2014. https://www.eia.gov/outlooks/documentation/workshops/pdf/Review%20of%20Natural%20Gas%20Models.pdf

[17]. "Natural Gas Distribution Infrastructure Replacement and Modernization: A Review of State Programs." National Association of Regulatory Utility Commissioners. January 2020. https://pubs.naruc.org/pub/45E90C1E-155D-0A36-31FE-A68E6BF430EE

market interest in new construction or expansion projects, pipeline operators can conduct open seasons to solicit and gauge interest in pipeline capacity.

- In response to natural gas market demand across various sectors in a given country (e.g. commercial and industrial demand, gas to power generation needs, domestic use, etc.), investments to expand, upgrade, and enhance accessibility to the natural gas pipeline transportation infrastructure should rise in order to enable the industry landscape. Governments should conduct market and planning assessments to analyze and plan natural gas transmission network development for gathering pipeline, transmission pipeline, compressor station infrastructure, meeting stations, gas storage, and other necessary infrastructure build-out.
  - *Note: gas gathering pipeline infrastructure is usually developed or acquired pursuant to long-term contracts with gas producers, which can create entry barriers for third parties to operate in the gas pipeline infrastructure market.*[18]

- If the government is the entity investing in natural gas infrastructure, then it would conduct planning of the infrastructure; the regulator would simply assess the reasonableness of the plan. If the private sector is investing in the infrastructure, then the regulator would make sure that the plan is consistent with government policy and will review the infrastructure plan and assess its reasonableness.

- *Standard filing requirements for all projects of similar type*
  - Regulatory commissions should publically publish standard filing requirements and necessary information that gas utilities must include in submitted proposals for natural gas pipeline construction projects. Commissions reviewing more extensive construction project applications may require additional information and specifications beyond typical standard filing requirements. Standard filing requirements can also provide information requirements for obtaining required permits if a proposed project affects public land or waterways.[19]

- *Cost/Benefit*[20] *Analysis and Risk Assessment of Proposed Projects*
  - Proposers of network investment projects are required to conduct a cost-benefit analysis to determine whether the proposed investments are approvable by the overseeing regulatory commission and allocable in the utility's rate base; cost recovery uncertainty can lead LDCs to take a conservative approach to infrastructure replacement initiatives.

- *Infrastructure Replacement/Upgrade Plans*
  - Natural gas infrastructure replacement and upgrade plans generally consist of: (a) reliability projects necessary to maintain safety, (b) economic projects to bring cheaper gas to the market, or (c) multi-value projects that improve reliability and increase the capacity to bring more gas to the market. These classifications encompass

[18] "Gas Pipeline Infrastructure Market Size, Share & Trends Analysis Report by Operation, By Application, By Region, and Segment Forecasts, 2020-2027." Grandview Research. 2019. https://www.grandviewresearch.com/industry-analysis/gas-pipeline-infrastructure-market

[19] "Application Filing Requirements [for] Natural Gas Pipeline Projects." Wisconsin Public Service Commission. October 2017. https://psc.wi.gov/SiteAssets/2017NGAFR.pdf

[20] Benefits may include: the economic benefit in the region of bringing in a large industrial customer that consumes large volumes of natural gas, or diversifying the electric generation mix by constructing a highly efficient low emission natural gas combined cycle power plant.

projects for replacement or upgrade of increasingly unsafe pipeline infrastructure on clearly defined schedules for construction.

- A key role of the regulator in overseeing proposed gas infrastructure replacement plans is examining whether the gas LDC's technical justification of scope, prudency of requested costs, and anticipated construction schedule are appropriate or require revision. For example, a commission closely reviews a proposal to replace aging pipeline infrastructure that poses safety risks, and whether the proposed replacement plan appropriately addresses the safety concern. Commissions can audit cost recovery through riders and general rate cases, and audit the LDC management of upgrade and replacement programs.[21]

- Generally, regulated gas companies subject to regulatory oversight regularly replace gas pipeline infrastructure as part of their normal operations, recovering related costs from gas customers through approved rates. If the government owns the infrastructure, they will build and replace pipeline as they age for safety. Regulators in the U.S. employ gas safety inspectors that go all over the state and inspect pipelines, including high pressure transmission lines. They also audit the LDC's maintenance programs.

- In the U.S. state of Washington, the WUTC mandates that gas companies proposing infrastructural upgrade projects must formally file pipe replacement program plans with sufficient documentation targeting the following considerations, among others:

    - Regulators must require that gas transmission operators regularly inspect and existing natural gas transmission infrastructure for inefficiencies, leaking, and excessive flaring, as poorly maintained natural gas transmission systems can lose ten percent of transported natural gas to leaks, vents, and flaring issues. Before purchasing more expensive imported gas to add to the domestic system, a given country should prioritize inspection and optimization of existing infrastructure to help prevent against costly system losses.

    - provide a detailed plan and timetable for identifying location of pipe presenting elevated risk of failure

    - Provide a measured and fact-based, reasonable response in relation to the elevated risk (that does not unduly burden ratepayers) that the gas company has demonstrated; the WUTC anticipates that some master plans for replacement can exceed 20 years.

    - issue demonstration that the pipe replacement program is in the public interest

- Ultimately, the applicant *must receive Commission approval* of the pipe replacement program plan; the Commission determines an appropriate approval process for each plan after it is filed. In Washington, gas companies can apply for a pipe replacement

[21] "Order No. 16-0376." Illinois Commerce Commission. January 2018. https://www.icc.illinois.gov/docket/P2016-0376/documents/262806

program cost recovery mechanism (CRM) to support infrastructure upgrade costs, subject to review and approval by the Commission.[22]

- An applicant should identify target pipe posing elevated risk of failure through cracking, leakage, breakage, or other failure due to age, manufacturing material, installment conditions (such as poor soil), maintenance conditions (such as cathodic protection), and other considerations. The proposing gas company should provide detailed analysis and explanation regarding why the infrastructure warrants replacement.

- The useful life of pipeline material depends on many factors including soil conditions, general environmental conditions and type of pipe material. As mentioned in the Roadmap document on pipeline replacement, Washington State requires regulated utilities to have a 20-year plan to replace elevated risk pipe. Most of the pipe in Washington State has been replaced or upgraded in the last 30 years with an expected useful life of least 50 years or longer depending on the material and environmental conditions.

- In Illinois, companies that are currently installing transmission and distribution piping are depreciating those assets around the 50 year range - but expected life may reach 100 years. Pipeline assets that are currently being removed due to safety or reliability purposes were originally installed 50 to 75 year years ago.

3.2. Day 0 - Wholesale Market (Anticipated Timeline: 2-3 Years, Minimum)

Section 3.2 discusses the key regulatory and market provisions in place to encourage open access to downstream natural gas transmission and storage infrastructure, as well as unbundled or separated operations to incentivize competition and innovation over time as the sector matures.

- *Cultivate and Incentivize Reliable Sources for Natural Gas Imports (if Importing LNG)*
  - Effectively lowering barriers to gas market entry by easing regulations limiting new entrants from competing in the gas market can encourage engagement and investment in a country's downstream gas market, as interested natural gas players are often deterred from investment if the barriers to market entry are too strenuous or risky.

  - Indicating that there is high demand for LNG resources in the country can signal to potential LNG exporters worldwide that the country solicits interest in the commodity.

  - Cultivating trade alliances with countries that export LNG resources can help foster reliable contracted LNG sources to help ensure reliable supply.
    - There is a variety of contracting options for LNG. New discoveries of natural gas and new facility development should provide flexibility to buyers. Even Russia and Qatar have shown that their take-or-pay clauses are somewhat flexible. In today's market consumers cannot be forced to accept a take-or-pay contract. For example, U.S. contracts can be indexed to the Henry Hub and provide significant benefits to consuming nations.

[22] "Commission Policy on Accelerated Replacement of Pipeline Facilities with Elevated Risk." Washington Utilities and Transportation Commission, Docket UG-120715. December 2012.

- *Unbundling of* Gas *Production from Transmission*
    - In the U.S., the separation or unbundling of gas production from transmission services (unbundling occurring at a point close to the gas production area) separates production from the rest of the industry. It also introduces competition among producers and transmission operators playing separate and essential roles in the trajectory of unbundled gas products, which ultimately trickles economic benefits downstream. Unbundling gas production from transmission services is designed to encourage competition across the natural gas value chain and mitigate against anti-competitive behavior, such as vertically integrated market players abusing market power across the value chain – ultimately charging higher prices for natural gas that are not reflective of efficient market pricing. Unbundling enables the market to govern competition at various stages along the downstream natural gas trajectory, and unbundling requirements are implemented to ultimately manifest in lower natural gas prices for end consumers.

    - As for the ownership of pipeline assets and commodity assets, a parent company can have two subsidiaries by which one subsidiary engages in transportation and the other subsidiary engages in natural gas commodity sales – that is, for as long as these two subsidiaries remain independent of each other, do not provide benefits to each other to the detriment of competition and efficiency, and follow strict standards of conduct rules.

- *Unbundling of Transmission from Storage and Distribution*
    - Underground gas storage is an essential component of an efficient and reliable natural gas transmission and distribution network. Access to underground natural gas storage facilities permits the mainline transmission pipeline operator to accommodate the level of total shipper firm (reserved) capacity commitments and the pipeline operator's potential storage injection needs for baseload requirements.

    - Unbundling and thus full legal separation of entities providing pipeline transmission services and gas storage services entails that different entities are able to compete to provide these respective services, encouraging entry of new actors and further competition among providers for these crucial services along the gas transportation value chain. Further, gas transmission services are to be completely legally separate from gas distribution activities to achieve similar competitive economic outcomes.

- *Non-discriminatory / Open Access to Transmission Pipeline Capacity and Storage*[23]
    - A country's energy regulatory commission should publish general administrative provisions establishing open access regimes for natural gas pipeline transportation and storage services. In the U.S., FERC's Order 436[24] was designed to foster a regime of open-access[25] – non-discriminatory transportation along natural gas transportation

[23] Local distribution utilities, retail suppliers, and large consumers may choose where to buy natural gas from and on what transmission pipeline to be transported.
[24] "FERC Order 436. Regulation of Natural Gas Pipelines after Partial Wellhead Decontrol." Federal Register, Vol. 50, No 202.Page 266. https://tile.loc.gov/storage-services/service/ll/fedreg/fr050/fr050202/fr050202.pdf
[25] "PL04 Order 436 ("Open Access" Pipeline Transportation). Interstate Natural Gas Association of America.https://www.ingaa.org/Pipelines101/Economics/25816/1341/1502.aspx

infrastructure.[26] Open access regimes for gas pipeline and storage infrastructure increase market competition by allowing for new market entrants, ensuring non-discriminatory accessibility among qualified users,[27] and helping to dismantle the potential for monopolistic market actors. The open access mechanism ensures that "all shippers have meaningful access to the pipeline transportation grid including storage so that willing buyers and sellers can meet in a competitive market to transact the most efficient deals possible,"[28] ultimately ensuring that consumers have "access to an adequate supply of gas at a reasonable price."[29] This provision, integral to well-functioning and competitive gas markets, is crucial for encouraging new entrants and subsequent competition among numerous parties using pipeline capacity and storage services, ideally leading to more economical pricing outcomes.

- With open access comes the need for establishing and enforcing common reliability standards, also referred to as a network code for all Transmission Pipeline System Operators (TPSOs). Apart from natural gas quality and heat content standards and broader pipeline safety standards addressed below, other measures need to be implemented and regulated to plan for scheduled maintenance or service disruptions, such as outlining alternative options for pipeline delivery pathways, or "line pack" pressurization allowances.

- Ideally, the development of natural gas Transmission Code into basic rules which include requirements, procedures and standards on the operation and maintenance of Gas Transmission Pipeline should be a part of regulatory reforms. It would be easier for market participants to benefit from natural gas if there is a certain basic uniformity in the rules.

- Guidelines and regulations can be developed to ensure fair and equal access absent technical limitations. On the quality of the natural gas, these guidelines will again provide the appropriate standards that all facility users will have to adhere by.

- Regulations should be developed to prevent hoarding of unused capacity tied to long-term contracts. In general, the same third party access rules should apply to everyone. However, if a state-owned enterprise is also acting as a supplier of last resort or other important function not assigned to any other entity, then certain exemptions may be allowed or necessary.

- In the U.S., the state regulators adopt and enforce the US Department of Transportation gas pipeline safety standards[30]. As for quality of service standards, each state has its own rules and regulations expressed through minimum service standards.[31]

[26] Lipscombe, Christopher. "Open Access to Natural Gas Transportation Session 2." Presented at NARUC's Natural Gas Regulatory Workshop in Cotonou, Benin. February 2012. https://pubs.naruc.org/pub.cfm?id=53724D07-2354-D714-51C9-BEF915B02FD7

[27] "Third Gas Directive (DIRECTIVE 2009/73/EC)." European Union. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32009L0073&from=EN#d1e2682-94-1

[28] "ORDER NO. 636 - RESTRUCTURING OF PIPELINE SERVICES."

[29] Ibid.

[30] "Ohio Laws and Rules: Chapter 4901:1-16 Gas Pipeline Safety." LAW Writer® Ohio Laws and Rules. http://codes.ohio.gov/oac/4901:1-16

[31] "Ohio Laws and Rules: Chapter 4901:1-13 Definitions." LAW Writer® Ohio Laws and Rules. http://codes.ohio.gov/oac/4901:1-13

- *Establish Natural Gas Quality Standards – Heat Content (typically in the 950-1050 BTUs/Cubic Feet or 35-39 MJ/Cubic Meter)*
    - Gas quality specifications should be designed to ensure that gas tendered to, and delivered by, the interstate pipelines is safe and reliable, and meets the requirements of end-use applications. These quality specifications should not unreasonably limit the development of new or expanded gas supplies, or limit the diversity of sources of gas supply.[32]

    - Due to the nature of gas products and transportation mechanisms, the quality of delivered gas product is often primarily determined by the pipeline. End users such as utility generators must know the expected range of fuel quality delivered to them and, ideally, to have some control over that fuel variability in order to ensure compliance with gas quality regulations and protect their investments in generating equipment – in order to be able to meet the needs of their customers in the most economic manner.

3.3. Day 1 - Transmission Pipeline Capacity & Contracts (Anticipated Timeframe: 1-2 Years)

Section 3.3 discusses provisions for allocating pipeline transmission capacity, contract options, and platforms required for trading transmission pipeline capacity.

- *Price Transparency of:*
    - *Just and reasonable capacity contracts on the pipelines (fully regulated)*
        - Large-volume customers who require uninterrupted pipeline service enter into advance contractual arrangements for "firm" gas pipeline transportation services that ensure pipeline capacity is available when needed, to allow the customer to benefit from ensured capacity reliability. Firm contracts are selected by customers such as gas-fired generator entities or local distribution companies who must ensure that continuity of service can be met through consistent and invariable gas supply. Typically, unused firm gas pipeline capacity reverts to the pipeline and is sold as interruptible service, for which rates can be substantially lower than rates for firm service.[33] The buyer pays a relative premium for this type of premium firm or primary firm guaranteed pipeline delivery service.

        - In contrast, non-firm (interruptible) pipeline capacity agreements are lower-priority capacity arrangements and generally cost less than firm capacity arrangements. Under non-firm contracts, transmission of natural gas to power plants may be stopped or curtailed if firm contract holders utilize the available capacity, or if other interruptible customers outbid the recipient. Because interruptible service is less costly, gas-fired power plants may enter into interruptible contracts during off-peak seasons due to lower capacity

[32] "Natural Gas Quality and Gas Interchangeability." American Gas Association. https://www.aga.org/research/policy/natural-gas-quality-and-gas-interchangeability/

[33] "Increased Dependence on Natural Gas for Electric Generation: Meeting the Challenge." National Regulatory Research Institute. April 2004. https://pubs.naruc.org/pub/FA861FBD-A490-25FB-215C-D6BB79FE8807

constraints. With interruptible service nominations, the shipper expects interruptions on short notice, particularly during peak periods. Higher priority shippers can un-scheduled interruptible service.

- It is notable that there are no real advantages in long term contracting. Long term contracts limit both the buyer's and seller's abilities to benefit from fluctuations in the market, and may limit end users' abilities to pursue alternative options (such as renewable resources – take or pay).

- There are certain aspects of transmission tariffs that should be consistent, as well as gas quality, the manner it is delivered, et cetera. However, the main differences between contracts for capacity, assuming they all represent delivery from and to similar locations, are flexibility and price. In general, a longer term firm contract should receive a price break compared to shorter term contract for capacity. Those longer term contracts may have more ability to select secondary receipt points with reduced penalties or other rights (capacity release - ability to sell/assign capacity to another entity for set periods) that can differentiate them from shorter term contracts. The non-firm capacity contracts should be cheaper than the firm contracts, but with more restrictions associated with their use (point to point delivery without secondary locations, for example).

- *Natural Gas Commodity (fully deregulated)*
  - In order to develop an efficient commodity market, introducing and fostering market competition is the most effective catalyst to creating a robust market. In the U.S., FERC Order 636's provisions were strategically enacted to promote "competition among gas suppliers [which] will benefit all gas consumers and the nation by ensuring an adequate and reliable supply of clean and abundant natural gas at the lowest reasonable price."

  - In marketing commodity, the risk of stranded investment is *de minimis* compared to infrastructure. However, countries developing their natural gas markets can benefit from the experience of more mature natural gas markets, gleaning lessons learned from the regulatory and market reforms implemented. Key considerations include: identifying current and future gas suppliers, determining if LNG storage facilities and upstream pipelines will be common carriers or participants in the commodity market, deciding on how downstream pipeline and LNG storage capacity should be allocated, and assigning LDCs to serve as either the commodity supplier or transporter.

  - The actual price of natural gas commodities is fully deregulated and reflective of market forces and pricing; natural gas commodity pricing in the U.S. is determined in the New York Mercantile Exchange (NYMEX) commodity futures market for natural gas spot prices and futures prices. Analyzed and published daily, natural gas futures pricing informs wholesale commodity buyers and customers further downstream.

  - Anything associated with the natural gas commodity is or can be part of the competitive market. Transportation, storage and local distribution remain

monopolies because of the nature of the investment required. As such, in the U.S., interstate transportation, storage and local distribution will remain regulated (i.e. not competitive).

- *Availability of a Trading Platform for Pipeline Capacity and Commodity*
    - To execute pipeline capacity trading, sellers must have gas transport capacity rights to the point of sale, and buyers must have gas transport capacity rights away from points of sale. Regulations should be designed to free-up pipeline capacity and instigate the development of capacity trading platforms. One of the successful defining features of the U.S. gas market is the existence of mandatory electronic capacity trading platforms on which contract shippers can trade contract rights for licensed pipeline capacity. Full transparency for capacity rights – including prices, underlying physical capacity, and covering parties – prevents against the ability of pipeline interests to obstruct fair gas markets, allowing for deregulated pipeline capacity markets and robust competition.

3.4. Day 2 – Establish Retail Market (Anticipated Timeframe: 1-2 Years)

Section 3.4 discusses the final stages of competitive downstream natural gas markets, including open access to local gas distribution infrastructure, ideally cultivating competition at the local distribution level, transparency, and uniformity among licensing/certification application and review processes.

- *Unbundling of Distribution from Retail Supply of Natural Gas*
    - The unbundling of roles (maintaining separate legal entities) served by gas distribution companies and retail gas suppliers fosters competition among rungs of the retail market chain, yielding pricing benefits to end customers. With the deregulation of the gas retail market, customers have the ability to choose companies supplying natural gas, which encourages service and price competition among ideally differing providers of retail gas supply and distribution.

    - By unbundling retail suppliers that purchase natural gas commodities from gas distribution utilities that own distribution infrastructure to customers, consumers are further protected from entities exercising vertical market power and more likely to receive competitive prices for gas services. A functionally competitive market must exist in order to ensure that the deregulated market can provide reliable and least-cost gas-sales service to distribution customers.

- *Non-discriminatory / Open Access Retail Supply Tariff*[34]

    - For gas retail competition to work, the regulator shall require that local gas distribution operators provide open access to the locality's gas distribution pipelines through a regulated tariff. In these instances, the selected gas supplier/marketer purchases the customer's requested gas quantity and delivers it through the consumer's gas LDC, which charges the customer delivery fees. U.S. regulators do not allow gas utilities to profit from selling the delivered third-party gas.

[34] Retail suppliers have equal access to the distribution network, and to balancing services and storage (if available).

- Open access to the retail distribution grid (including storage and balancing services, if applicable) for third party gas retail suppliers is intended to diversify downstream competition, as local gas distribution companies are essentially regulated monopolies. *Ideally*, enabling participation of third party gas suppliers and providing open access to local gas distribution infrastructure cultivates competition if the third party suppliers can provide competitive pricing and services.

- *Clearly Defined Retail Supplier Certification Process (Financial, Technical, Managerial Capability)*
  - Businesses acting as natural gas retail suppliers are required to register with the overseeing regulator, and are generally required to obtain a license to operate before offering supply services publically. Licensing applications can require financial statements, bonding requirements, charter and incorporation documents, and proof of experience, among other required documentation certifying viability of the applicant to serve as a gas retail supplier.

  - Additionally, gas retail suppliers are usually required to register with local gas utilities before executing operations in utilities' respective service areas. Most gas suppliers are required to annually renew registration and keep business information up to date. Most regulators also require gas suppliers to file periodic reports with the commission to maintain transparency about the supplier's financial data, including annual sales and revenues, technical operations, and performance.

- *End Users' Choice of Retail Suppliers and Contract (Price/Term) Type*
  - For mature retail gas markets, establishing the ability for end users to select alternative retail gas suppliers (AGSs) that are different from their gas LDC through customer choice programs – referred to as "retail choice" – can encourage local price competition among gas retail suppliers and can incentivize innovative products and services. A retail choice scheme allows small volume customers the opportunity to purchase competitively priced natural gas commodity from an AGS outside of traditional bundled gas utility service. While a regulatory commission may not regulate the price of the gas commodity charged by AGSs, it may regulate the AGSs in the following ways:
    - Approve utility tariffs allowing for the existence of that retail choice program including delivery requirements for system reliability;

    - Issue certificates and approve qualification for AGSs serving small commercial and residential customers; and

    - Enforce the provisions of the governing Public Utilities Act identifying consumer protections for gas supply offered by AGSs.[35]

  - End users opting for AGSs enter into contracts with differing terms and conditions including pricing, monthly changes to supply pricing, usage deviating from the quantity a supplier/LDC is prepared to accommodate, contract length, and early termination penalties.[36] For example, to serve as an AGS providing gas services to small commercial and residential customer segments in Illinois, a potential AGS must obtain

[35] "Annual Report on the Development of Natural Gas Markets in Illinois." Illinois Commerce Commission, Office of Retail Market Development. October 2019. https://www.icc.illinois.gov/icc-reports/report/AnnualReportOnDevelopmentOfNaturalGasMarkets

[36] "NIPSCO Natural Gas Choice Program." Indiana Office of Utility Consumer Counselor. https://www.in.gov/oucc/2400.htm

an official certification of service authority from the regulatory commission, register with the presiding gas LDC, complete technical testing before offering retail natural gas service, and illustrate adherence to requirements identified in the Illinois Public Utilities Act.

- Differentiation by customer consumption is an important facet of retail sales terms and local distribution. Certain smaller markets may only have two customer classes, identified by their maximum annual consumptions. However, establishing more types of customer class allows more regulatory and pricing flexibility. For example, in Massachusetts, LDCs maintain up to ten customer classes. Rates can then more accurately reflect the costs incurred by the LDC to serve the respective customer class, and allow for subsidization of low income customers by other customers. Terms of payment may also vary by customer class, providing more protections to residential customers than commercial and industrial customers enjoy.

- *Retail Market Monitoring and Mitigation against Anti-Competitive and Fraudulent Marketing Practices*
  - As conditions in competitive gas retail markets evolve, effective market monitoring should be implemented to surveil and hedge against anti-competitive behavior among participating market players. In the U.S., public utility commissions can model and examine respective gas market concentration ratios by customer class and assess competition among market players by using the Herfindahl-Hirschmann Index (HHI), a common indicator that computes relative competition among competing entities in a defined market.[37]

  - Realistically, a competitive market can have "good" and "bad" actors participating; a good regulator builds into his/her regulatory oversight appropriate accountability and enforcement mechanisms to ensure that any "bad" actors in a competitive retail market are appropriately dealt with, while incentivizing good actors. Such regulatory oversight can take many forms. For example, in order to help ensure that the retail market runs smoothly and competitively, regulatory commissions should establish and maintain consumer complaint divisions responsible for receiving and investigating customer complaints.

  - Public utility regulators are generally more concerned with identifying fraudulent behavior of marketers for residential and small business customer classes, as larger industrial and commercial customers are often more equipped to make decisions about their gas services – and these larger customers are often not retail customers connected to the distribution grid. Some of these larger customers are referred to as "transportation" customers, and buy gas from the wholesale market directly, simply reserving capacity on gas pipelines for these needs.

  - In the U.S., states have independent consumer advocate entities that can serve to help protect utility customers from fraudulent gas marketing practices by providing consumer education materials warning against misleading outreach from AGSs. In addition, these entities can provide lists of information that ratepayers must consider if they consider switching to an AGS's services, including the AGS's "price to

[37] Annual Report on the Development of Natural Gas Markets in Illinois. Illinois Commerce Commission, Office of Retail Market Development. October 2019. https://www.icc.illinois.gov/icc-reports/report/AnnualReportOnDevelopmentOfNaturalGasMarkets

compare" vis-à-vis the LDC's rates, eligibility, escalated price increases in a contract with the AGS and others. These consumer protection initiatives help to educate and protect ratepayers from potentially contracting with an AGS for prices or services they were not fully aware of prior to executing service agreements.

- Gas retail market monitoring requires the development of a substantial database of relevant information at wholesale and retail gas levels, as well as the expertise required to determine from pertinent data whether or not market power is present and exercised in regulated gas markets. Comprehensive market monitoring assessments can help improve the regulator's understanding of gas rates, prices, billing practices, and cost savings made possible by instituting customer choice.[38] These practices are intended to ensure full benefits of free and open competition to retail gas consumers.

[38] "A Plan for Effective Market Monitoring of the Wholesale and Retail Markets for Electricity, Gas, and Telecommunications." Public Service Commission of the District of Columbia. December 2001. http://www.utilityregulation.com/content/reports/DC12_31.pdf

For questions regarding this publication, please contact
David Bloom (dbloom@naruc.org) or
Erin Hammel (ehammel@naruc.org).

National Association of Regulatory Utility Commissioners (NARUC)
1101 Vermont Ave, NW, Suite 200
Washington, DC 20005 USA
Tel: +1-202-898-2210
www.naruc.org