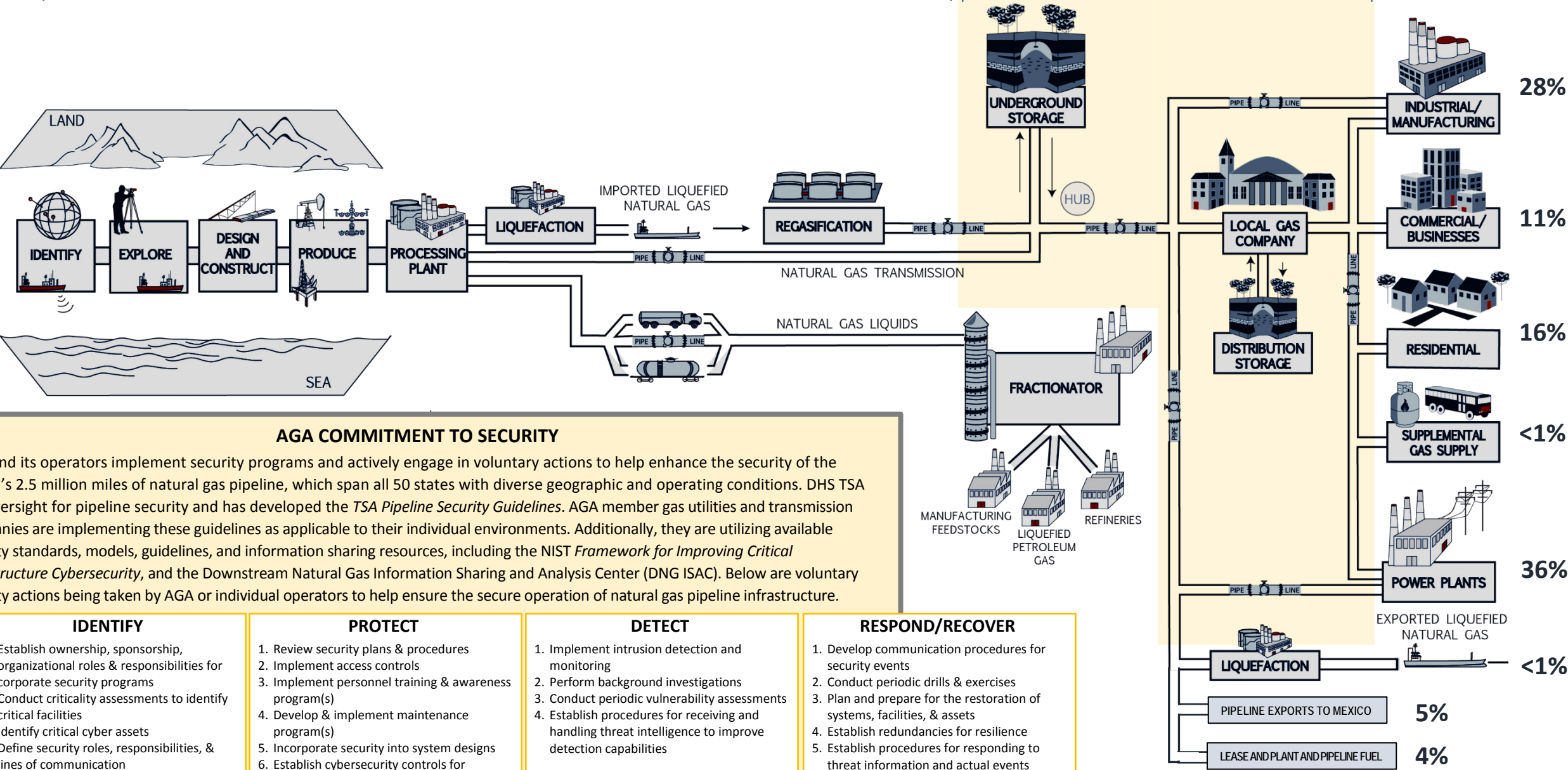


Downstream Natural Gas Supply Chain

Natural Gas System Resilience

Transportation Security Admin., DHS Infrastructure Security Compliance Division, DOT Pipeline & Hazardous Materials Safety Admin., U.S. Coast Guard, DOE, Federal Energy Regulatory Commission

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AGA COMMITMENT TO SECURITY

AGA and its operators implement security programs and actively engage in voluntary actions to help enhance the security of the nation's 2.5 million miles of natural gas pipeline, which span all 50 states with diverse geographic and operating conditions. DHS TSA has oversight for pipeline security and has developed the *TSA Pipeline Security Guidelines*. AGA member gas utilities and transmission companies are implementing these guidelines as applicable to their individual environments. Additionally, they are utilizing available security standards, models, guidelines, and information sharing resources, including the *NIST Framework for Improving Critical Infrastructure Cybersecurity*, and the Downstream Natural Gas Information Sharing and Analysis Center (DNG ISAC). Below are voluntary security actions being taken by AGA or individual operators to help ensure the secure operation of natural gas pipeline infrastructure.

IDENTIFY

1. Establish ownership, sponsorship, organizational roles & responsibilities for corporate security programs
2. Conduct criticality assessments to identify critical facilities
3. Identify critical cyber assets
4. Define security roles, responsibilities, & lines of communication
5. Intelligence gathering & information sharing

PROTECT

1. Review security plans & procedures
2. Implement access controls
3. Implement personnel training & awareness program(s)
4. Develop & implement maintenance program(s)
5. Incorporate security into system designs
6. Establish cybersecurity controls for procuring systems & services

DETECT

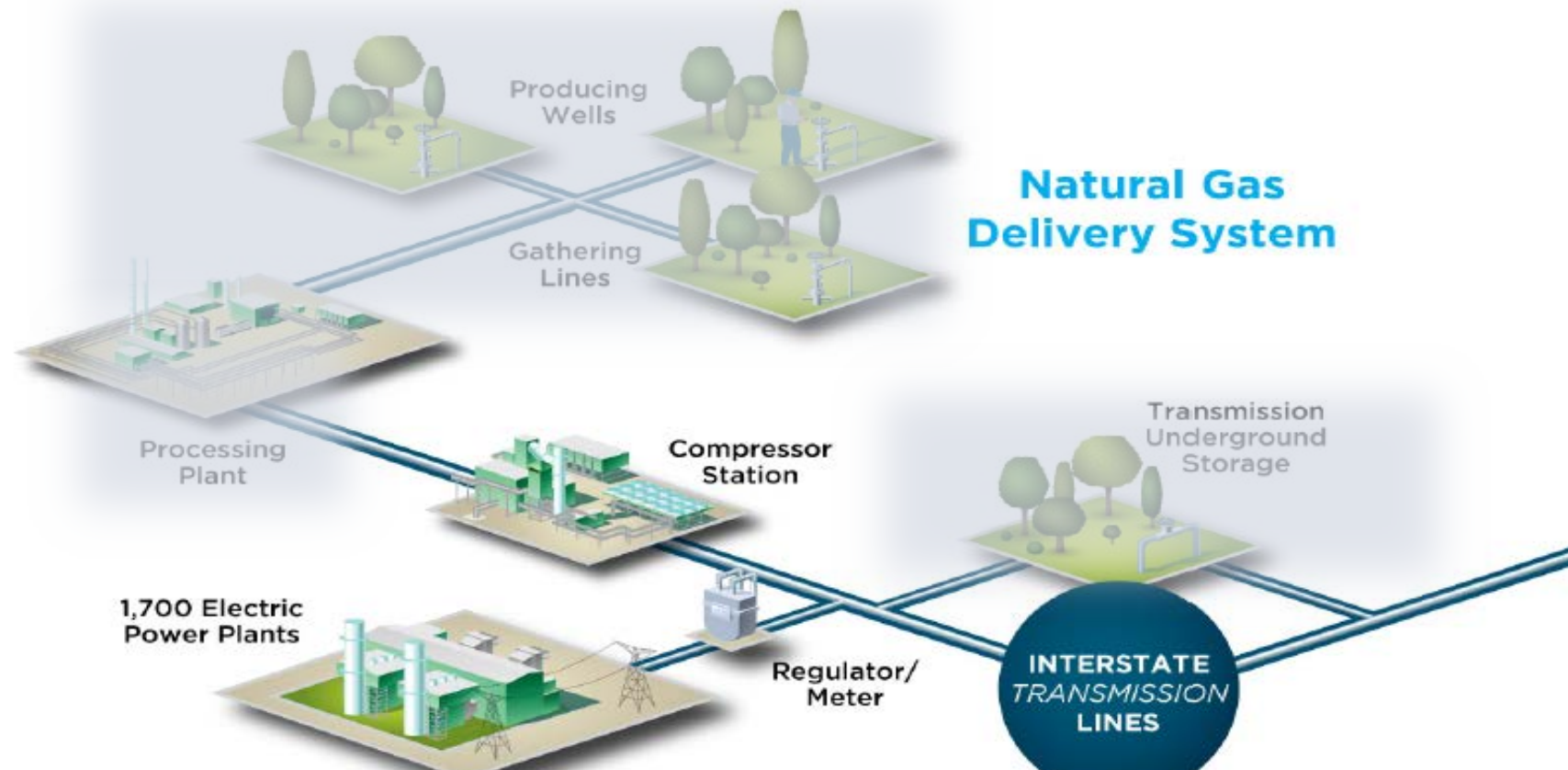
1. Implement intrusion detection and monitoring
2. Perform background investigations
3. Conduct periodic vulnerability assessments
4. Establish procedures for receiving and handling threat intelligence to improve detection capabilities

RESPOND/RECOVER

1. Develop communication procedures for security events
2. Conduct periodic drills & exercises
3. Plan and prepare for the restoration of systems, facilities, & assets
4. Establish redundancies for resilience
5. Establish procedures for responding to threat information and actual events

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NATURAL GAS PIPELINE SYSTEM & NATURAL GAS-FIRED ELECTRICITY GENERATION

According to the Energy Information Administration (EIA), natural gas-fired electricity generation reached record levels in 2016 with capacity likely to increase over the next two years. Natural gas is a safe, reliable, abundant, and cost-effective fuel source to efficiently and environmentally feed combustion turbines for electricity generation.

Natural gas is transported through pipelines subject to strict pipeline safety regulations mandated by the U.S. DOT Pipeline & Hazardous Materials Safety Administration (PHMSA). These regulations, 49 CFR Part 192, stipulate engineering, operations, and public safety requirements for construction and use.

There are 305,000 miles of interstate and intrastate transmission. More than 1,400 compressor stations maintain pressure on the natural gas pipeline network. Compressor stations are strategically sited to maintain pressure in the long-haul pipeline system, i.e., cross-country transportation.

The extent to which natural gas supply disruption impacts a natural gas-fired electricity generation facility depends on multiple factors, including but not limited to, the availability of alternate natural gas feeds/supplies, the drawdown or quantity of natural gas required by the generator during the duration of supply constraint, and/or contractual agreements. The needs of a generation facility as well as those of the pipeline system supplying the natural gas are unique to the market served, the regional location, and the environmental conditions.

SYSTEM RELIABILITY & REDUNDANCY

Compressor Station Configuration:

In general, natural gas compressor stations are designed with more than a single compressor unit. Each unit has the capacity to individually meet the majority of contracted natural gas demand. This is intentional to support scheduled and unscheduled unit maintenance or repair while not impacting system delivery.

Layers of Defense - Compressor Station Inoperability:

Few pipelines in the U.S. are single sourced, i.e., pipelines have multiple, if not hundreds, of interconnects and feed points. The major long-haul pipelines continue moving significant volumes of natural gas even if a single pipeline feed is removed.

Additionally, natural gas pipelines are bidirectional. In an extreme or emergency situation, operators can expeditiously change their system configuration to back-feed a pipeline and continue supplying natural gas to address the needs of customers contracted for firm service.

Long-Term Supply Disruption:

The inherent design of pressurized gas delivery systems is mechanical by nature, and qualified operators manage the internal pressure of the system by controlling the amount of natural gas entering and leaving the system. The process of increasing or decreasing pressure happens relatively slowly because of the compressible nature of the gas. The volume of gas contained in the entire pipeline system at any point in time is called the linepack.

In the event, compressor stations and/or pipelines are disrupted, the physical characteristic of gas compressibility lessens the immediacy of impact and trained gas control operators maximize linepack to the optimal advantage of pipeline operations for supply purposes.

Further, a pipeline bypass may be constructed around an inoperable compressor station to temporarily keep the supply moving. Pipeline operating pressure waivers issued by PHMSA may allow increased output pressure from upstream compressor stations. Portable LNG and CNG may also can be trucked to the market to assist with supply needs.