Natural gas production in the United States began in Fredonia, New York in 1821 when William Hart drilled the first well intentionally to obtain natural gas. Ever since, natural gas has grown in production and consumption, making pipelines an effective and efficient way of transporting natural gas over many distances. The three main segments of natural gas pipeline networks include the production, transmission, and distribution phases. These phases are essential to supplying the end-user or customer with useable natural gas.

Production

Wellhead: The wellhead is the component that connects directly underground to the natural gas well itself. It manages the pressure control when drilling to prevent blowouts, and also controls the flow and pressure of the gas leaving the well. Wellheads can be either located above ground/water (surface wellhead) or under water (subsea wellhead).
Gathering Lines: The gathering lines in the production process are usually around 2 to 6 inches in diameter and collect the raw gas from the wellhead. This gas is transported through the gathering lines to the processing and treatment plants where it is further purified and refined. Gathering lines may also connect with many other gathering lines directly to transmission lines to be transported elsewhere, which we will discuss shortly.

Transmission

Transmission Lines: Transmission lines are used to transport pressurized gas over long distances. Their main purpose is to connect the supply areas to the market. The market may be located in another state, which will require interstate transmission lines. They are larger than gathering lines, around 16 to 42 inches in diameter, and collect gas from many gathering lines and supply sources. Transmission lines must also be carefully maintained to prevent pipeline failures. They, along with most types of pipelines, must be monitored for issues with seams, welding, bulging of material, and corrosion. Lack of attention to these problems may result in a pipeline failure, which may lead to devastating effects.

Figure 3: Photograph of a Transmission Line being Laid.

Compressor Stations: Natural gas must remain highly pressurized in order to travel from point to point. Depending on the distance being travelled, the gas must be continually compressed every 40 to 100 miles. The compressors are similar to a large crankshaft and piston-driven engine that pulls in gas from a transmission line and drives it back out to increase the gas’s pressure to a range of 200 to 1500 psi. Compressor stations can use gas directly from the pipeline to fuel its engine or it can pull energy from the electric grid as well.
Storage: Instead of being immediately distributed, natural gas can be stored beneath ground in a few ways. Depleted natural gas and oil reservoirs, along with salt caverns, act as the most used storage facilities. Aquifers may also be used. Aquifers are the least used/efficient storage facilities since they do not use preexisting infrastructure and their boundaries are not defined.

Distribution

Distribution Lines: Distribution pipelines act as intermediate pressure zone between transmission lines and service lines, which we will define next. The size of these lines can range from 2 to 24 inches in diameter, while the pressure levels within them range from 0.3 to 200 psi. Distribution lines will end up delivering the gas to a natural gas company where the gas can be stored or sold to end-users using service lines.

Service Lines: These service lines are small pipes, which are around 2 inches in diameter, and operate at low pressures to deliver gas to individual consumers. The service lines are connected to a meter that provides the gas for the customer.

End-Users: The final users of natural gas may be residential, commercial, or industrial. Residential users would be customers that consume natural gas for power to their homes. Commercial users comprise of large-scale consumers, such as large offices, hotels, healthcare centers, and refrigeration buildings. Industrial users can be supplied natural gas to power machinery to produce products, such as metals, paper, stone, and processed food.

Conclusion
Natural gas pipelines do not act as a single tube that runs from the drilling site straight to your home. The gas that is supplied to the consumer goes through many steps before it is able to be used to create any sort of electricity. With a well already having been drilled in to, the wellhead will pump the gas through gathering lines to processing plants and refineries or directly to transmission lines. The large transmission lines will carry the gas over long distances at high pressures to storage facilities or further on to distribution lines. Finally, distribution lines deliver the gas to the market place, via service lines, where it can then be sold to the end-user.