Building a Resilient Energy Future

How the Gas System Contributes to US Energy System Resilience

The natural gas system, herein referred to as the gas system, is used to transport mostly geologic natural gas and renewable natural gas (RNG). In the future, the gas system can be leveraged, with only small upgrades, to transport more low carbon fuel supplies including RNG and hydrogen.

Resilience: The set of energy system abilities that allow it to prevent, withstand, adapt to, and quickly recover from system damage and/or operational disruption.

VS

Reliability: The ability of the energy system to deliver services in the quantity and with the quality demanded by end-users.

	Resilience	Reliability
Event	A major operation disruption occurs along a transmission pipeline, interrupting regional natural gas supply.	Power system demand starts peaking at 5:00 pm, just as variable solar generation starts ramping down for the evening.
Response	DR: Gas from storage assets are quickly diverted and dispatch activates demand response (DR) resources.	Natural gas-fired plants ramp up to meet the spike in system demand.
Outcome	Deliveries are maintained to customers during system repairs.	Customers maintain reliable service during daily supply and demand fluctuations.

Fundamental Resilience Characteristics of the Gas System

Inherent Resilience of Gas: The gas molecule is an abundant, diverse and compressible energy form with long-duration and seasonal storage capabilities.

Physical Resilience of Gas System Assets: Most gas system assets are underground and shielded from major disruptions. In most cases, the system is self-reliant, reducing its exposure to disruption.

Operational Resilience of the Gas System: Operational flexibility is designed into the gas system within a set of system standards that ensure the system's safety and security.

The gas system supports the resilience of the core customers it was designed to serve.

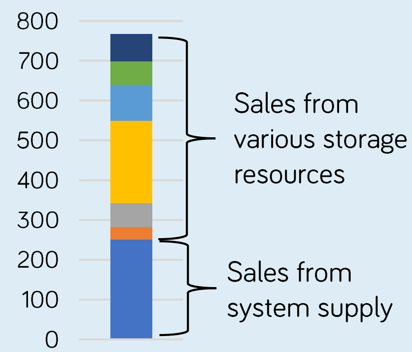
The gas system is designed to serve the residential, commercial, and industrial (core) customers. The predictable load profiles of these customers allow Local Distribution Companies to design, construct, and operate the gas system with a high degree of confidence in how the gas system serve customers throughout the year.

An example from NW Natural

During early February 2014, a polar vortex brought extreme cold temperatures, snowfall, and high winds to Oregon.

On February 6, during the system peak, NW Natural set a company record for natural gas sendouts, which still stands today. Nearly 50% of this peak demand was met by natural gas storage capacity.

Natural Gas Sales 2/6/2014 (thousands of Dth)



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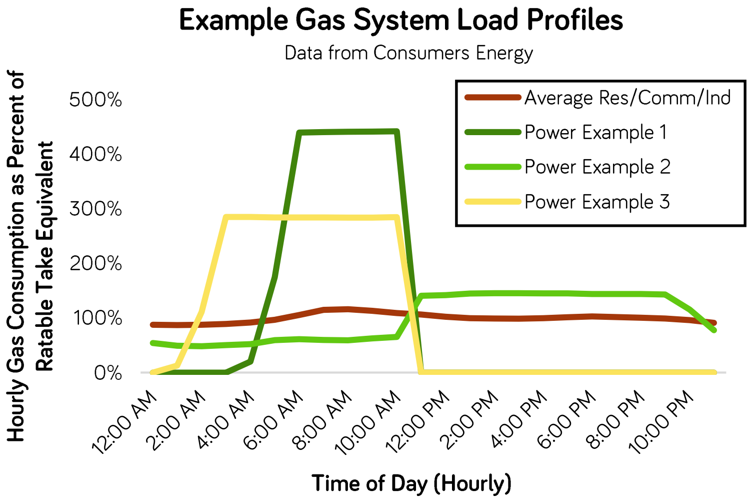
The gas system supports the resilience of the power sector.

The load profiles of gas-fired electric power generation facilities exhibit much higher variability and intraday swings than the gas system core customers. This is especially true of intermittent generation facilities that serve as dispatchable resources for electric system operators (examples 1 and 3).

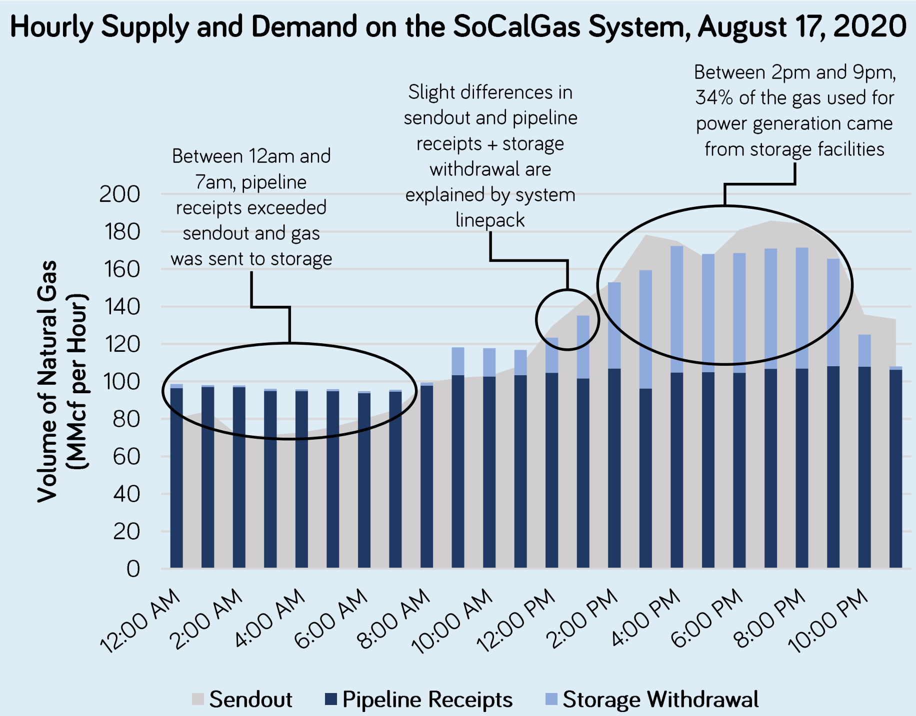
Although the gas system currently meets the demand needs of the power sector, supporting market mechanisms and commercial terms that govern day-to-day operations were not designed for this type of usage.



An example from SoCalGas

In August 2020, California was in the middle of its hottest August on record, a severe drought, and its worst wildfire season in modern history. Concurrent to increased demand on the electric system driven by increased cooling loads, California also experienced a decrease in renewable output (due to smoke from wildfires) and lower imports than had been anticipated by electric supply planners.

To meet increased electric demand, system operators turned to gas-fired generation facilities. During the week of August 11, all of SoCalGas' system storage assets were employed to fill the gap between abnormally high electric demand and low renewable energy generation experienced in Southern California.



Utilities, system operators, regulators, and policymakers need new frameworks to consider resilience impacts.

Energy system resilience needs to be defined as a measurable and observable set of metrics, similar to how reliability is considered.

Resilience solutions must be developed considering all possible energy options and across utility jurisdictions, requiring electric, gas, and dual-fuel utilities to work together to determine optimal solutions.

Methodologies need to be built to value resilience, such that it can be integrated into a standard cost-benefit analysis. Value should consider the avoided direct and indirect costs to the service provider, customers, and society.

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