27th WORLD GAS CONFERENCE | JUNE 25-29 | WASHINGTON DC | 2018

IGU

Utilizing Natural Gas Infrastructure for Reliable and Resilient Energy Supply

William Liss, Managing Director

Gas Technology Institute

HOST ASSOCIATION

AGA American Gas Association

PROUDLY SUPPORTED BY

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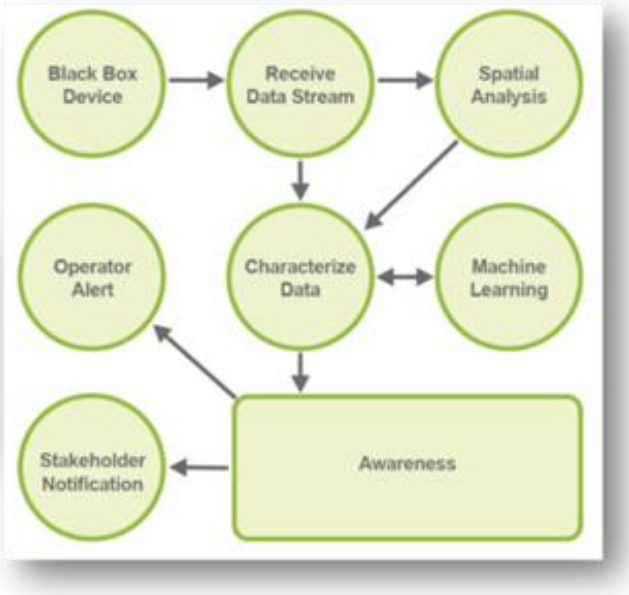
Introduction: Natural Gas Energy Supply Reliability as a Positioning Strategy

- Natural gas delivery systems are viewed as cost-effective, **safe**, and **reliable**
- Traditional and appropriate priority emphasis on safety
  - Will review example efforts
- **Can reliability have an elevated role – internally and externally?**

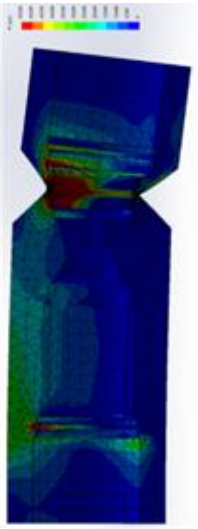
Safety: Excavation Encroachment Notification

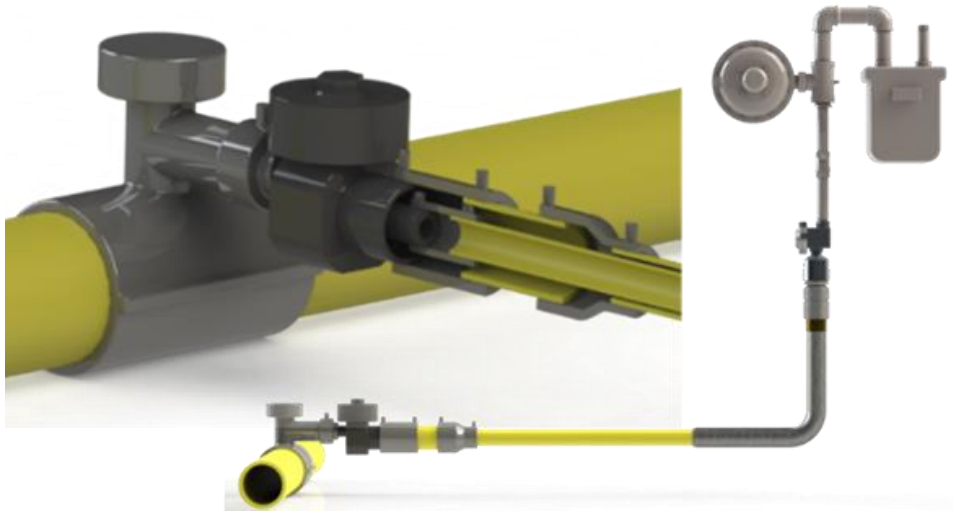
- GPS/GIS-based system for monitoring the geographical positioning and operating status of heavy equipment (e.g., excavators, ag tillers, etc) near natural gas pipelines
- In-cab system monitoring system that ties into GIS pipeline information. In-cab device has annunciator alerts vehicle operator of danger
- Over 150 units in pre-commercial testing



Safety: Damage Prevention from Vehicles & Other Outside Forces

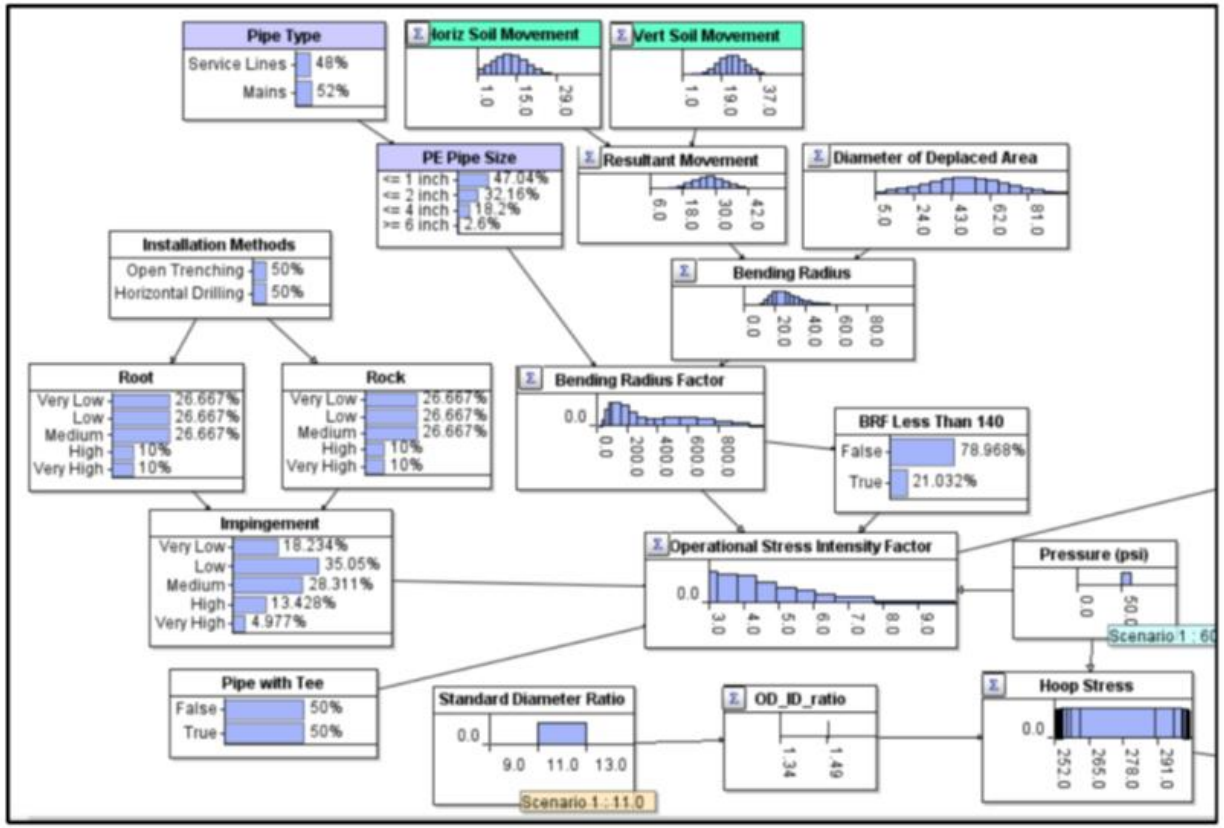
- Engineered Meter Breakaway Device (OPW)
  - Positive gas shutoff in case of damage from vehicle, falling ice, etc
- Distribution Line Safety System (Lorax Systems)
  - Annular two-pipe system
  - Detect major failures (like an EFV) but also very small natural gas leaks





Safety: Risk Modeling and Management

- GTI developing series of topical risk models
- One example is a major program on life expectancy and slow crack growth prediction for vintage plastic pipe
- GTI risk modeling in other areas, including iron/steel pipe, gas storage, etc



Energy Delivery Reliability & Resilience

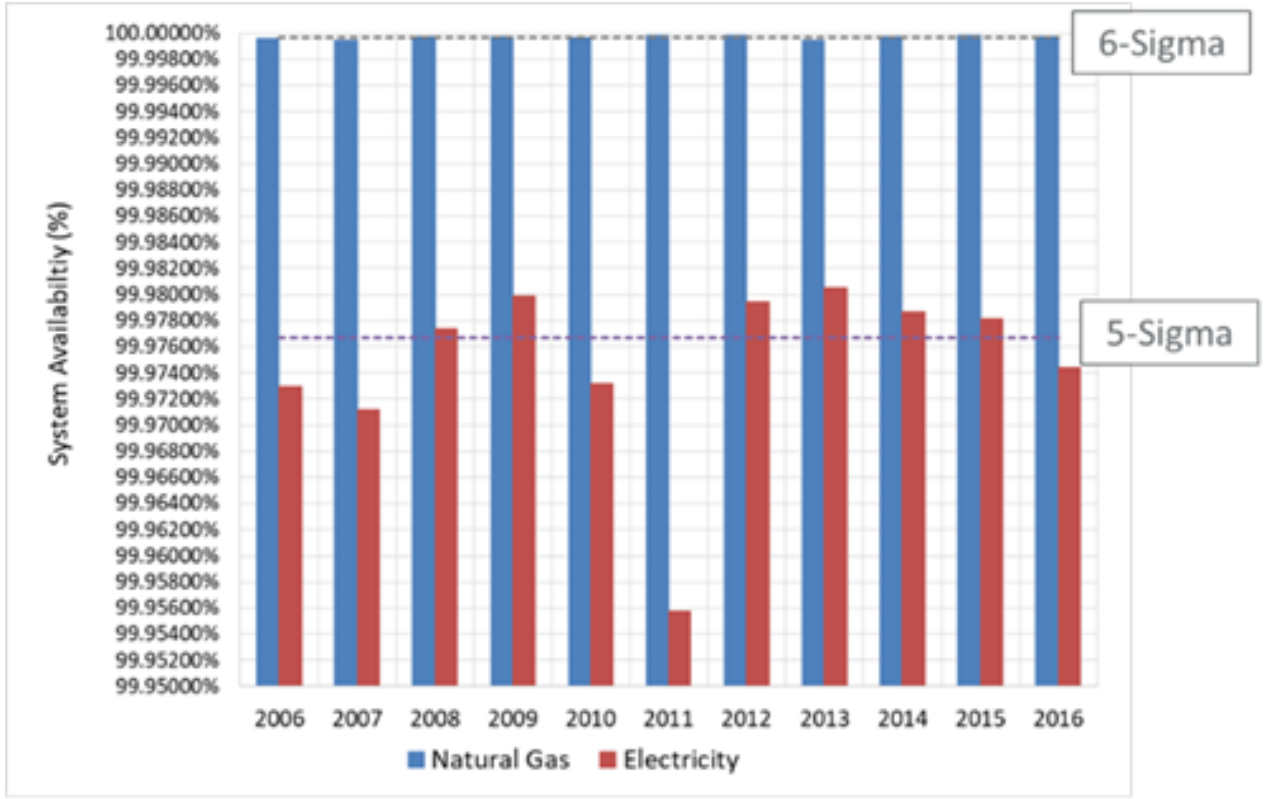
- Energy delivery system reliability and resilience gaining attention.
- Electric distribution utility service reliability often tracked (per IEEE methods), but natural gas service reliability not often available
- Energy service reliability can be a useful internal tracking metric for continuous improvement – and congruent with safety focus.
- Service reliability can also be used for external for differentiation (e.g., when compared to electricity) and positioning
  - Including new markets such as distributed generation and standby generators

Methods: Energy Delivery Reliability

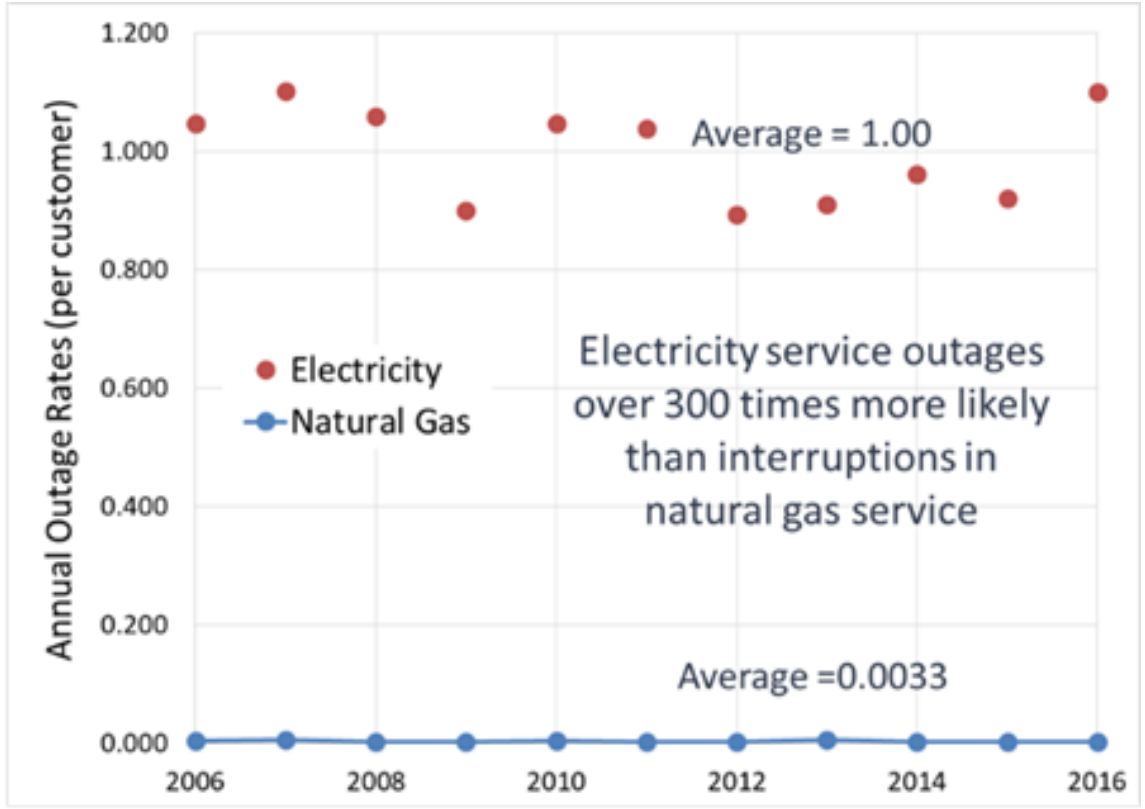
IEEE 1366 Electric Distribution Reliability Indices

IEEE Reliability Metric	Determination
System Average Interruption Duration Index (SAIDI)	Total time all customers were without service / total number of customers
System Average Interruption Frequency Index (SAIFI)	Number of sustained customer service outages / total number customers
Customer Average Interruption Duration Index (CAIDI)	SAIDI / SAIFI
Reliability (derived from SAIDI)	1- (total customer outage hours/ total customer hours)

Electric and Natural Gas Energy Distribution Reliability Case Study



Example annual results for major California electric utility (SCE) and North American gas utility (over 15 billion customer hours/year)



Example annual results for major California electric utility (SCE) and North American gas utility (over 15 billion customer hours)

Natural Gas Distribution Generation

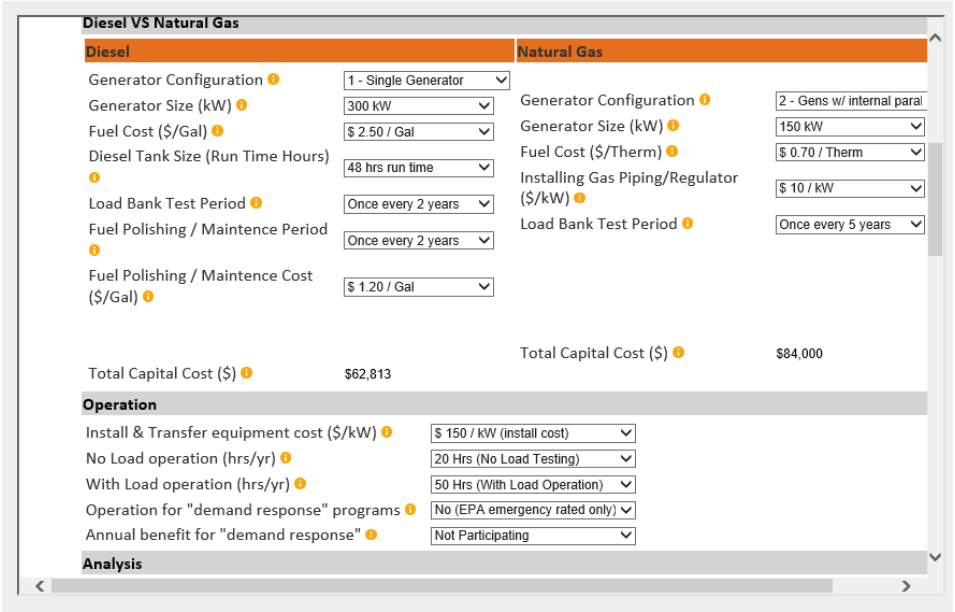
- Growing interest by residential, commercial, and industrial customers to use natural gas for distributed generation
  - Including standby and emergency generators
- Natural gas service reliability can provide advantages over liquid diesel fuel – coupled with lifecycle cost benefits

GENERAC INDUSTRIAL POWER

WHITE PAPER

Standby Power Generation Fuel Security – Diesel vs. Natural Gas

BY MIKE HAINZL
Power Solutions Manager at Generac Power Systems



Diesel VS Natural Gas

Diesel		Natural Gas	
Generator Configuration	1 - Single Generator	Generator Configuration	2 - Gens w/ internal paral
Generator Size (kW)	300 kW	Generator Size (kW)	150 kW
Fuel Cost ($/Gal)	$ 2.50 / Gal	Fuel Cost ($/Therm)	$ 0.70 / Therm
Diesel Tank Size (Run Time Hours)	48 hrs run time	Installing Gas Piping/Regulator ($/kW)	$ 10 / kW
Load Bank Test Period	Once every 2 years	Load Bank Test Period	Once every 5 years
Fuel Polishing / Maintence Period	Once every 2 years		
Fuel Polishing / Maintence Cost ($/Gal)	$ 1.20 / Gal		
Total Capital Cost ($)	$62,813	Total Capital Cost ($)	$84,000

Operation

Install & Transfer equipment cost ($/kW)	$ 150 / kW (install cost)
No Load operation (hrs/yr)	20 Hrs (No Load Testing)
With Load operation (hrs/yr)	50 Hrs (With Load Operation)
Operation for "demand response" programs	No (EPA emergency rated only)
Annual benefit for "demand response"	Not Participating

Analysis

www.generac.com/Industrial/all-about/natural-gas-fuel/natural-gas-performance

Conclusions

- Natural gas energy delivery systems generally viewed as cost-effective, safe, and reliable – but reliability not often quantified
- Fusing together safety and reliability can be mutually reinforcing framework for pipeline planning and operations
- Reliability can support natural gas positioning and branding
  - Pursuing distributed generation business opportunities
  - Importance and value of natural gas service reliability can inform policy discussions pertaining to implications of electric fuel switching

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