



The Role of Technology: Enhancing gas supply chain resilience

Second IEF Industry Advisory Committee Workshop

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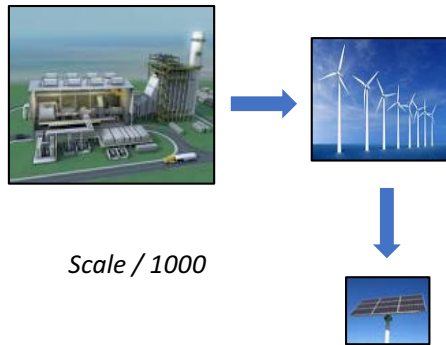
The disrupters

DECARBONIZATION

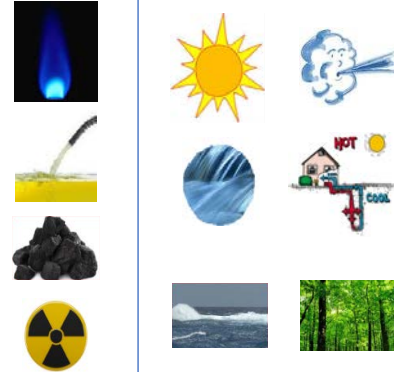
DECENTRALIZATION

DIGITALIZATION

Smaller, decentralized systems



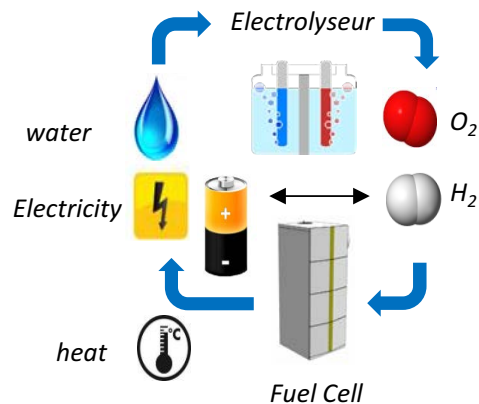
Larger array of energy sources



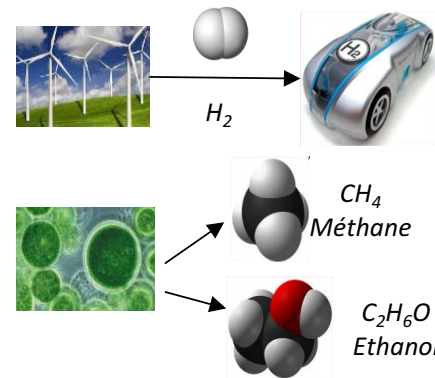
Price ↔ environnement



Gas and electricity grids are connected, storage becomes key



New alternatives emerge

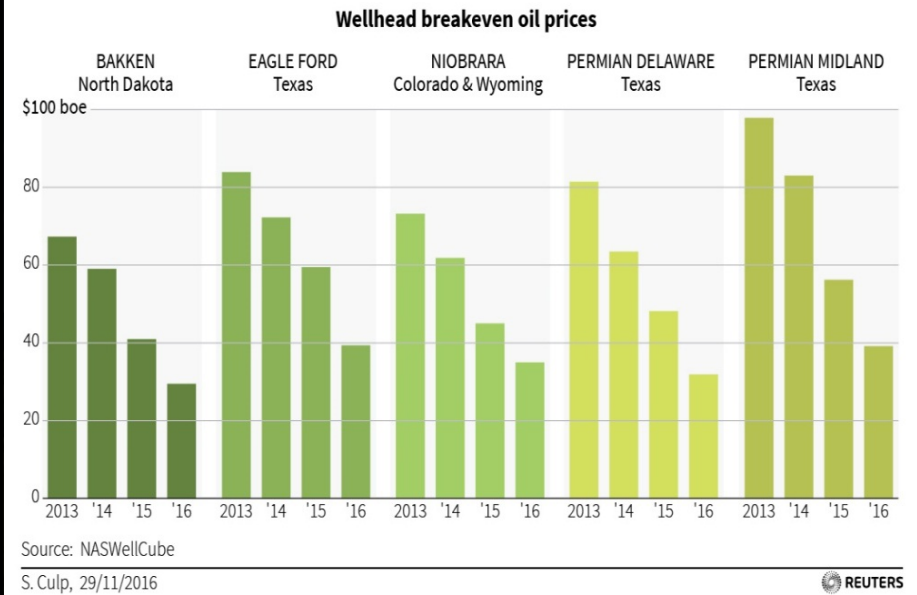


Digital: clients want control, optimization and data security



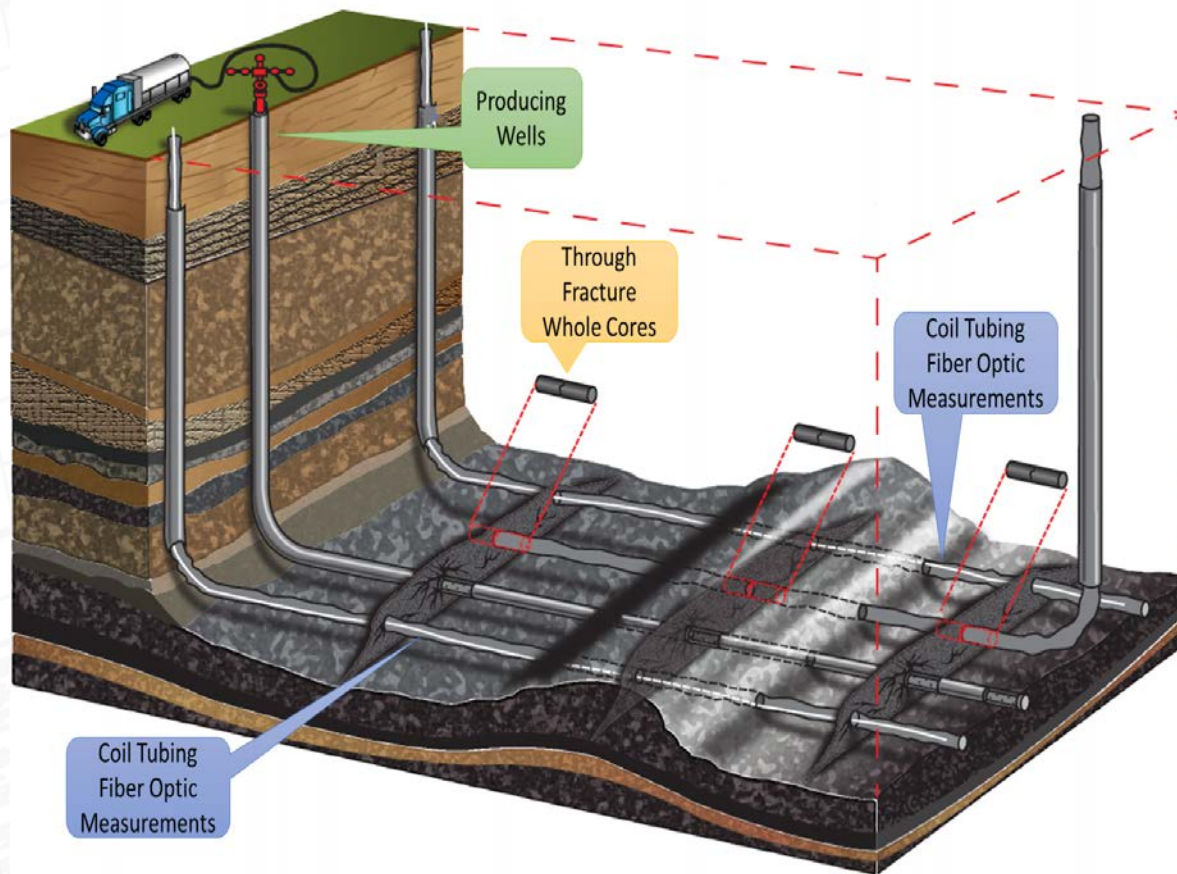
Improving Shale Gas Well Productivity

The falling cost of U.S. shale production



Hydraulic Fracturing Test Site

Ground Truth: Through-Fracture Cores



- Field-based HF research program
- Public-private partnership with gov't, industry and academia providing technical and financial support
- \$25+ million of new HF research "piggy backing" on 11 new horizontal wells over 400 fracture treatments, over \$100 million in background data
- Advanced diagnostics including SRV core through, multi horizon pressure monitoring, and proppant quantification
- Potential to reduce the number of wells required to develop west Texas resources by thousands

A Powerful Team

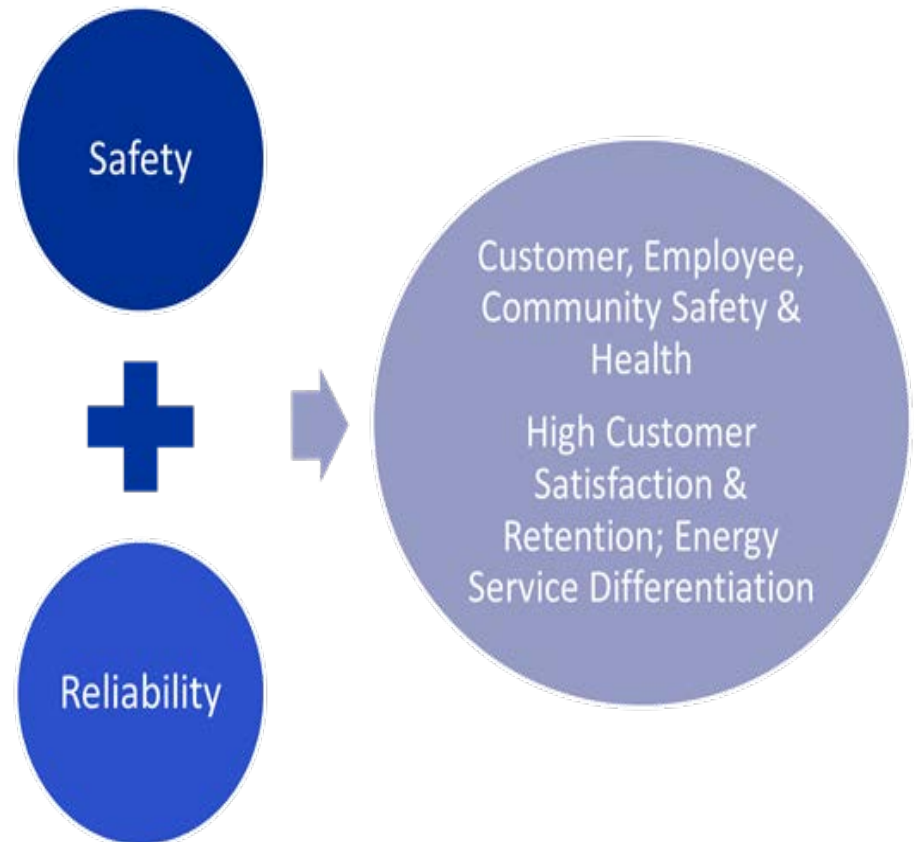


Sponsors and Participants

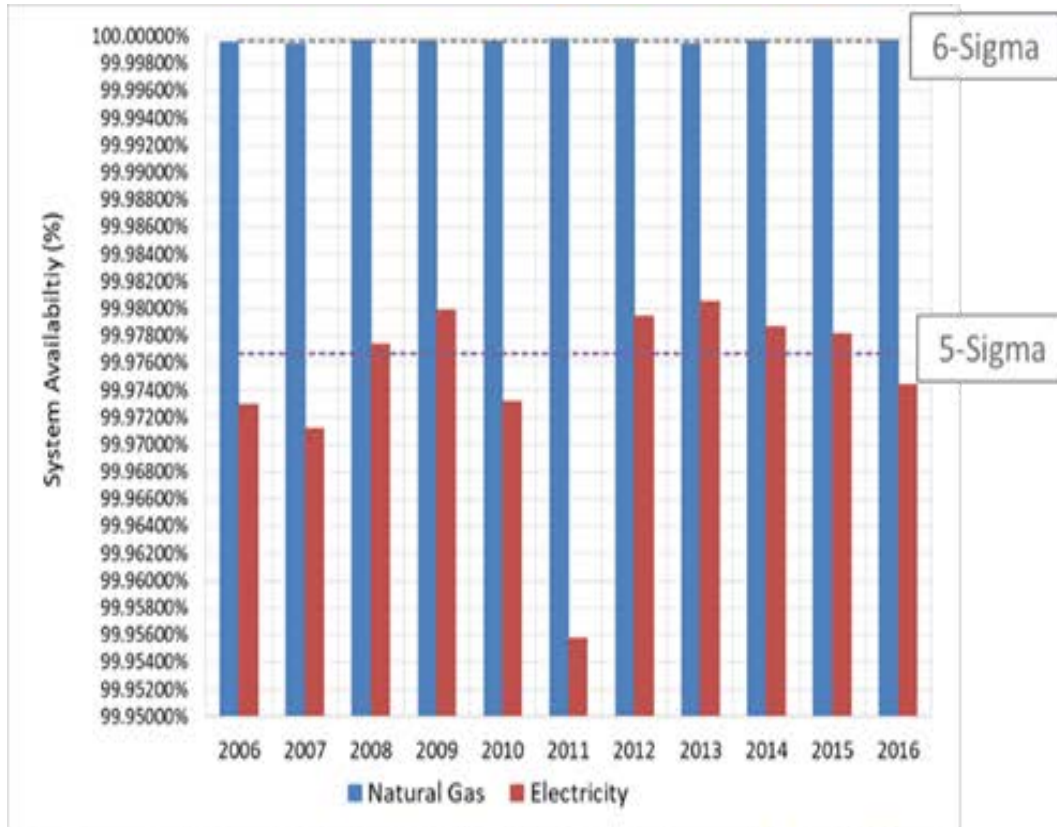


Natural gas supply reliability – a strong case

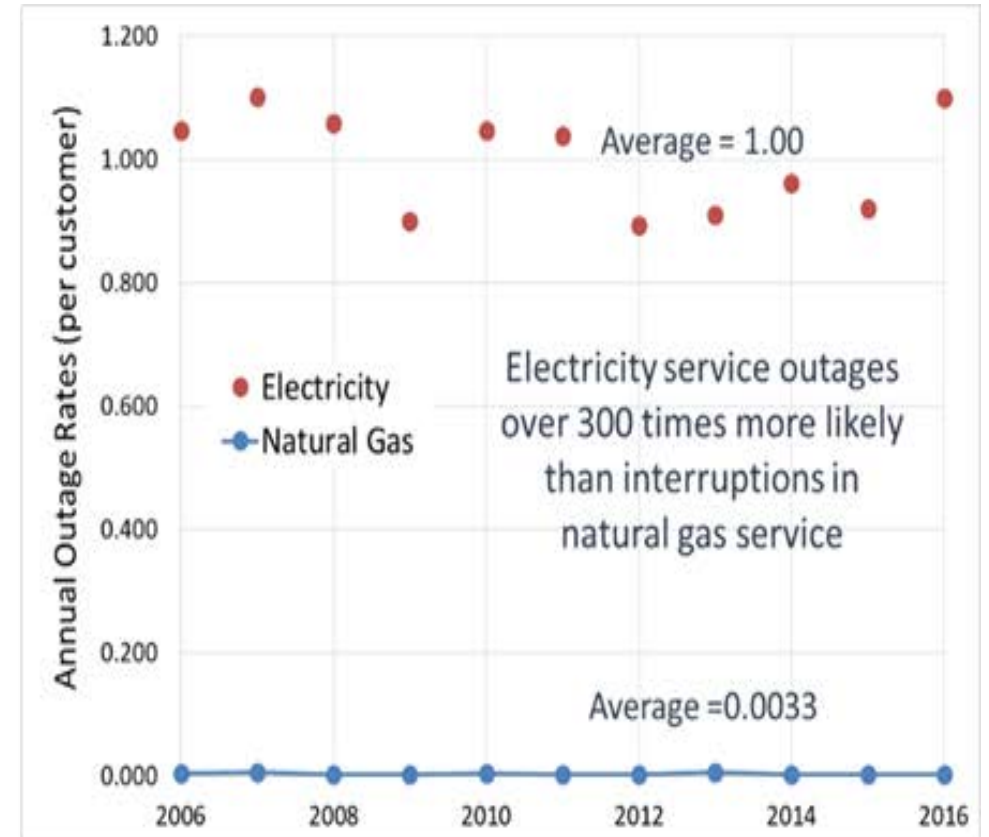
- Natural gas delivery systems are cost-effective, safe and reliable
- How reliable?
- Do customers and stakeholders understand and value system reliability?
- Can reliability be leveraged as a positioning strategy?



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)



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New tools improve gas pipeline reliability and safety



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