# PRCI/GTI
# Underground Storage Committee

**Pipeline Research and Development Forum**
**December 11 – 12, 2003**
**Washington, D.C.**

**Karen Benson**
**Panhandle Energy**

gti

PRCI
Technology for Energy Pipelines

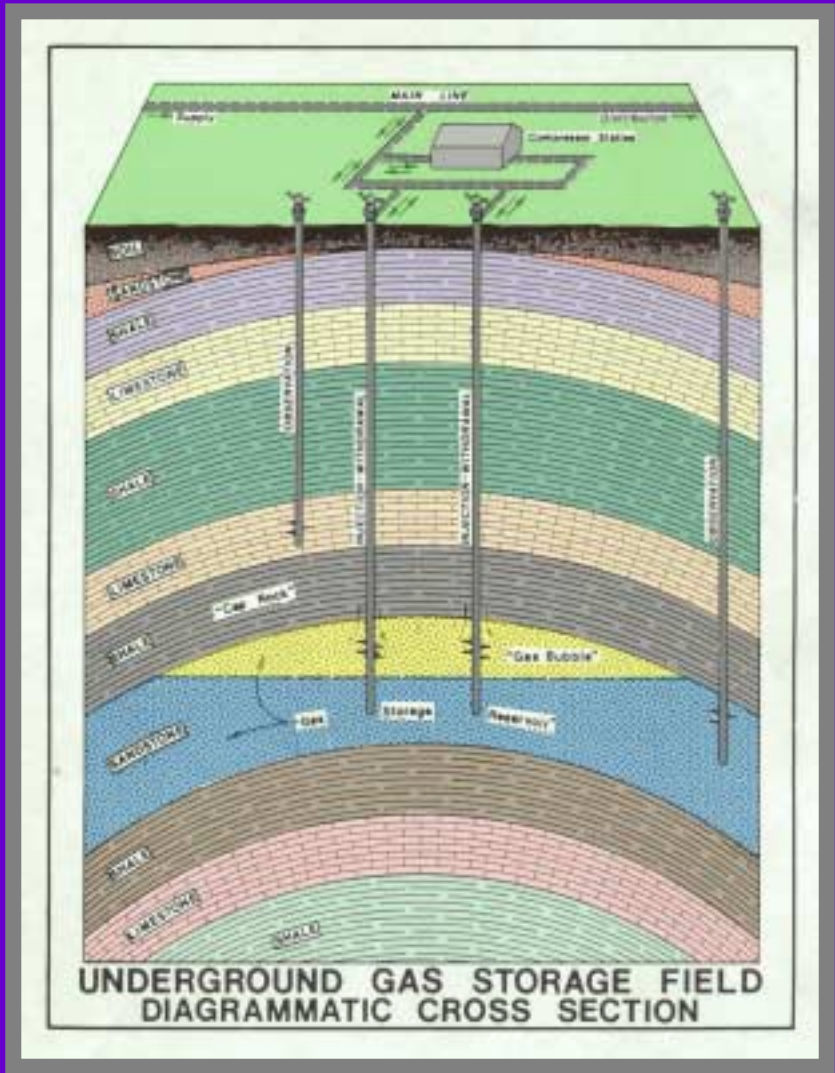
# What is Gas Storage?

- **Gas Storage helps optimize the gas grid by keep pipelines full:**
  - Gas is withdrawn from storage when demand exceeds supply, and injected when supply exceeds demand
  - Satisfies seasonal demand
  - Provides emergency supply
  - Absorbs operational swings
  - Reduces pipeline capital costs

gti

PRCI
Technology for Energy Pipelines

# How Gas Storage Works




On injection, pipeline gas is injected down the wells into the storage reservoir.

On withdrawal, reservoir gas flows up the wells, gets cleaned up and put back into the pipeline.

gti

PRCI
Technology for Energy Pipelines

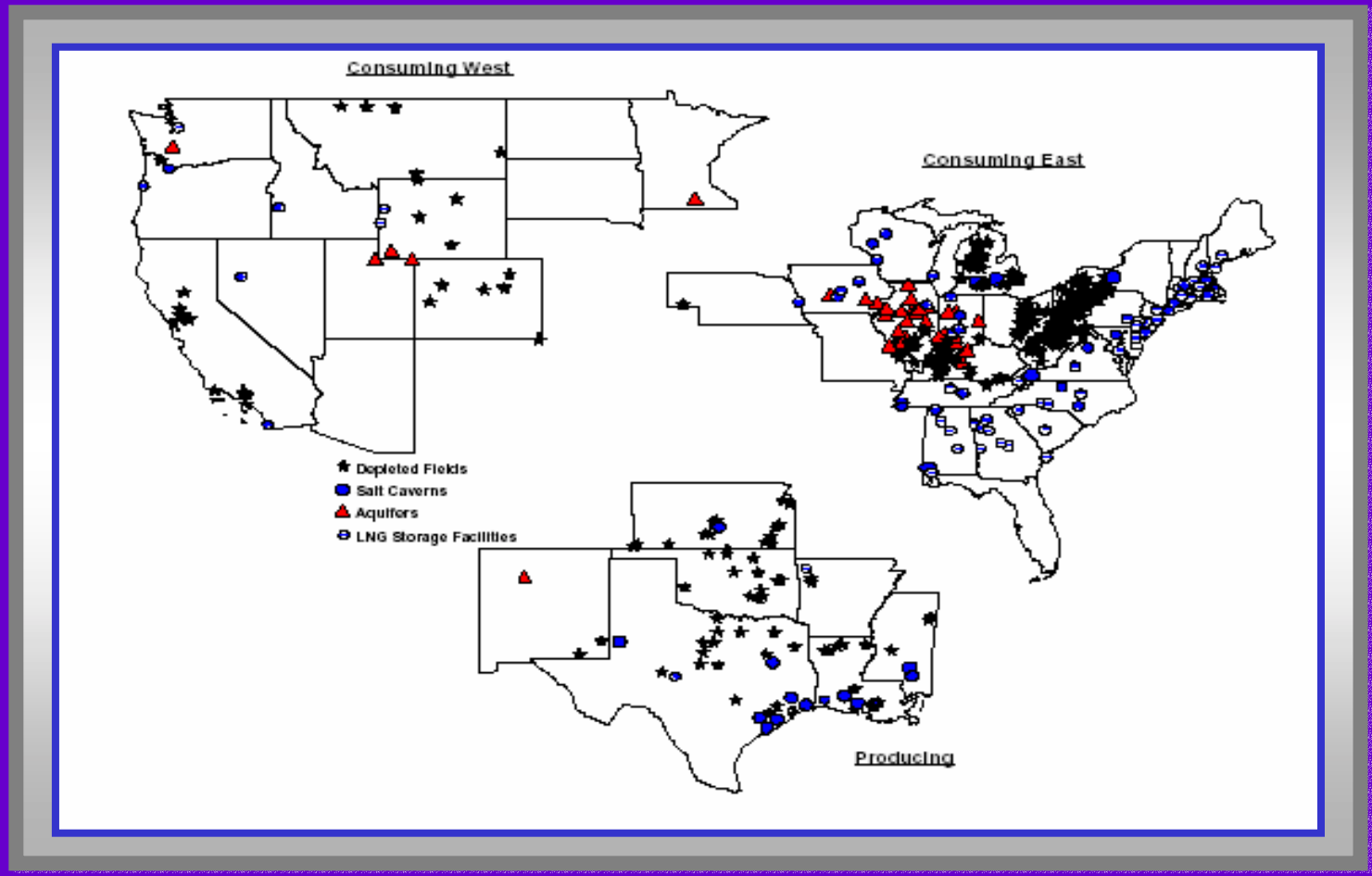
# The U. S. Gas Storage Industry

- **~110 storage operators**
- **~415 storage facilities**
  - 348 in depleted oil and gas reservoirs
  - 40 in aquifer reservoirs
  - 27 in salt caverns
- **~19,000 wells**
- **3.9 Tcf of working gas capacity**
- **78 Bcf/day of peak deliverability**

gti

PRCI
Technology for Energy Pipelines

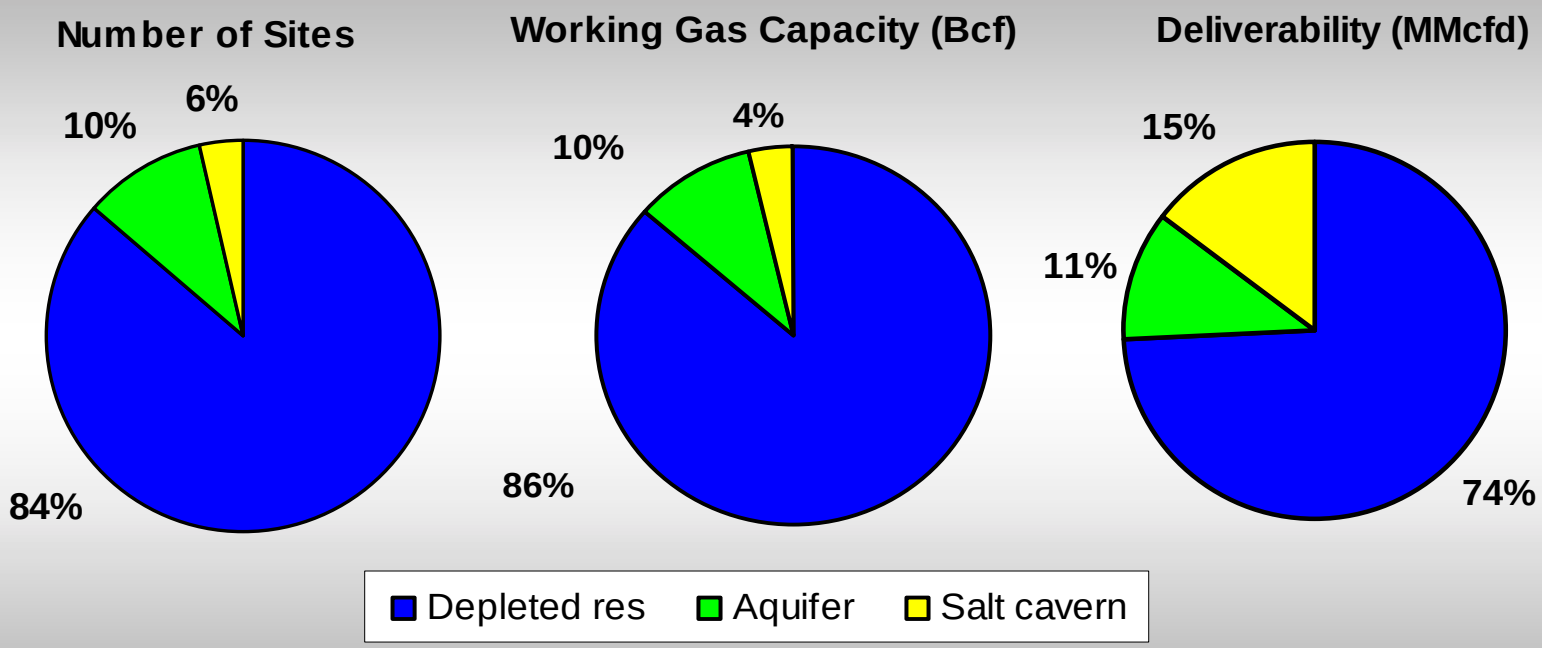
# Storage Locations in the U.S.




gti

PRCI
Technology for Energy Pipelines

# Storage by Type of Facility



# The PRCI/GTI Gas Storage Committee

- **Members are interested in advancing storage research:**
  - 9 pipeline company operators
  - 7 LDC operators
  - 2 liquid pipeline operators
  - 4 international storage operators
  - 4 storage research partners
- **Decisions are collaborative and cooperative**

gti

PRCI
Technology for Energy Pipelines

# Mission Statement

**Develop and deploy underground storage technologies that address current and changing customer demands for storage services so as to ensure the safety, integrity, reliability, and cost-effectiveness of new and existing facilities.**

gti

PRCI
Technology for Energy Pipelines

# Why Gas Storage R&D is Important

- NPC estimates that $400 MM/year (2002 $) of capital expenditures will be required from 2004 – 2025

- Industry estimates that up to $100 MM/year of O&M expenditures required to maintain existing storage facilities

gti

PRCI
Technology for Energy Pipelines

# Current Programs

- Improve Underground Storage Integrity Assessment
- Enhance Storage Capacity, Deliverability & Reliability
- Improve Design and Operation of Cavern Storage Facilities

gti

PRCI
Technology for Energy Pipelines

# Improve Integrity Assessment

- **Focus on existing facilities - Proactive approach**
- **Benefits include better decisions:**
  - ~ $50 million spent annually on well work
  - Targeted cost reduction of 5%
  - Decisions impact SYSTEM RELIABILITY
- **Example projects include well casing strength assessment and development of high resolution casing inspection tools**

gti

PRCI
Technology for Energy Pipelines

# Enhance Performance & Reliability

- **Growing/changing markets require:**
  - Additional storage
  - New services from existing storage facilities
  - Benefits target decreased O&M expenses and development costs
  - Current projects ~ $3 million expected annual savings
- **Example projects include hydrate detection/remediation and systematic testing of well contaminants**

gti

PRCI
Technology for Energy Pipelines

# Improve Cavern Storage Performance

- **Focus on cavern/peaking facilities**
  - Liquids storage in caverns
- **Benefits include decreased O&M and development costs**
  - 2003 projects carry $1.7 million estimated savings
- **Example projects include enhanced thin-bedded salt cavern design and improved mechanical integrity testing procedures**

gti

PRCI
Technology for Energy Pipelines

# Proposed 2004 Programs

| Program | PRCI/GTI Funding | Potential Cofunding | Total Funding |
|---|---|---|---|
| Integrity Assessment | $670K | $650K | $1320K |
| Performance Enhancement | $260K | $180K | $440K |
| Cavern Storage | $40K | $40K | $80K |
| TOTAL | $970K | $870K | $1840K |

gti

PRCI
Technology for Energy Pipelines

# DOE/PRCI
# Gas Storage Research Consortium

- **DOE will fund $4.2 MM over 4.5 years**
- **40% industry cofunding required**
  - PRCI will provide up to $400K/year for projects approved by UGS Committee
- **Penn State University will administer**
- **Kickoff meeting was 12/11/03**
- **Next meeting in late January, 2004**
- **Hope to award contracts June, 2004**

gti

PRCI
Technology for Energy Pipelines

# Questions? Comments?

gti

PRCI
Technology for Energy Pipelines