



Natural Gas Energy Efficiency

NASEO Conference

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Gas Technology Institute

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Gas Technology Institute

- > Leading U.S. research, development and training organization serving energy markets
- > Headquarters: Des Plaines, IL
 - 300,000 sq-ft facility, 18-acre campus
- > Staff: 340
- > Branches: Washington, Houston, Birmingham, and Tulsa
- > 331 member companies
 - 291 U.S., 40 international

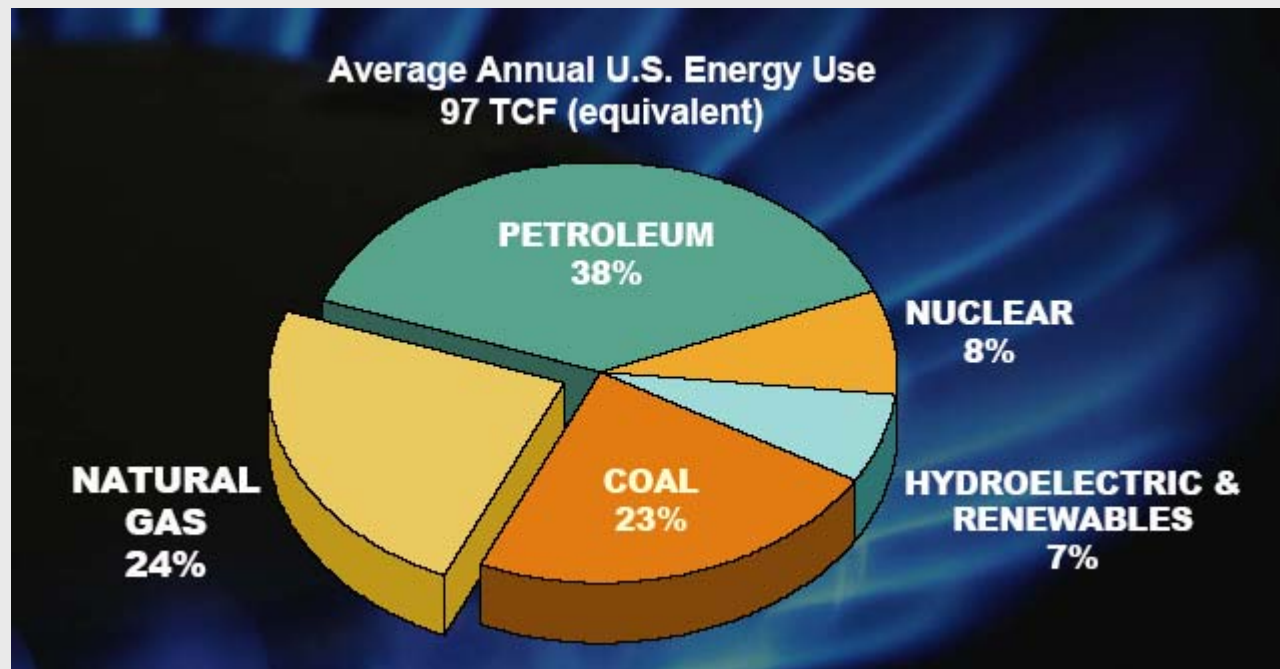


GTI: What We Do

- > Develop cost-effective technology solutions for use from wellhead to burnertip

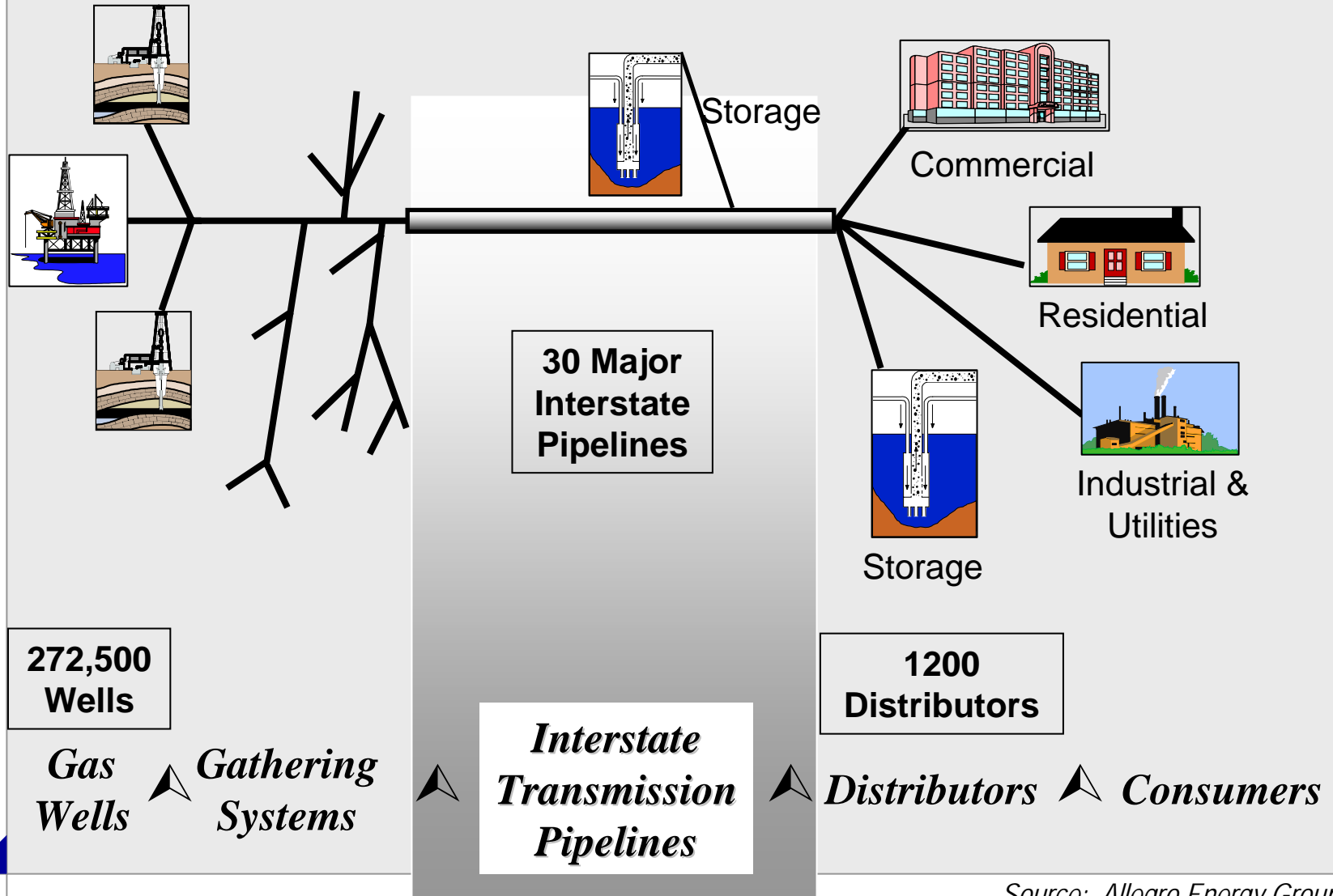


Role of Natural Gas in the U.S. Economy

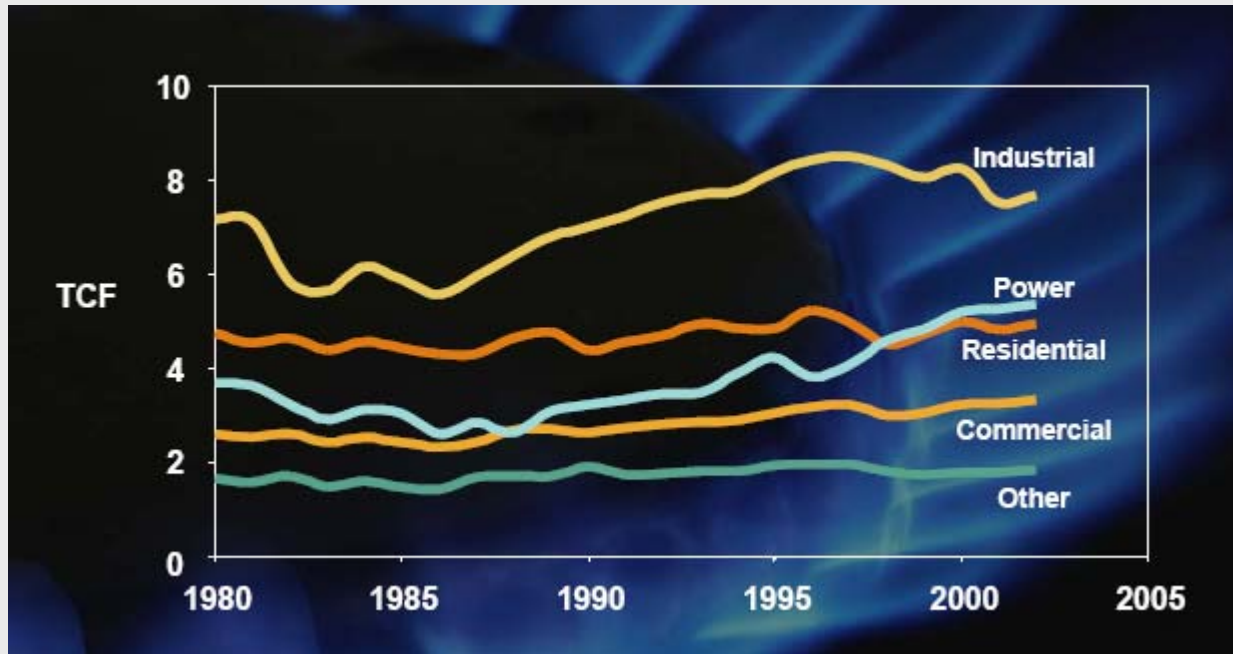


National Petroleum Council Study: September 2003:
Balancing Natural Gas Policy: Fueling the Demands of a Growing Economy

U.S. Natural Gas Infrastructure



Growth in Natural Gas Demand



National Petroleum Council Study: September 2003:
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Gains in Electricity End Use Efficiency

- > Without the energy efficiency gains made in electric use, over the past 40 years, the US would have consumed another 25% to 30% more electric power.
- > Electric appliances and end use technologies continue to become more efficient and deployment of specific energy efficient technologies have been substantially increased through the support of State and Federal R&D and deployment dollars.
- > Delivered Grid Electricity currently between 31% to 35% percent efficient

Natural Gas End Use

- > Industries – Glass, Aluminum, Metal Fabricating, Ethanol Production, Heat Treating, Food Processing, Chemical Manufacturing, Plastic Manufacturing, Steel, Large Scale Steam and Electricity Production, etc
- > Commercial – Heating, Cooking, Cooling, Small Scale Power Generation
- > Residential – Heating, Hot Water Heating, Cooking
- > Delivered natural gas to end user 95%-97% efficient

How Can States Impact Natural Gas Energy Efficiency

- > Incentives for development and deployment of high efficiency gas technologies
- > Support R&D for the development of new more efficient and cleaner gas technologies
- > Support heavy industry process efficiency improvements
- > Incentives for the deployment of improved high-efficiency building materials and advanced heating and cooling systems
- > Encourage USDOE to support and fund these types of programs

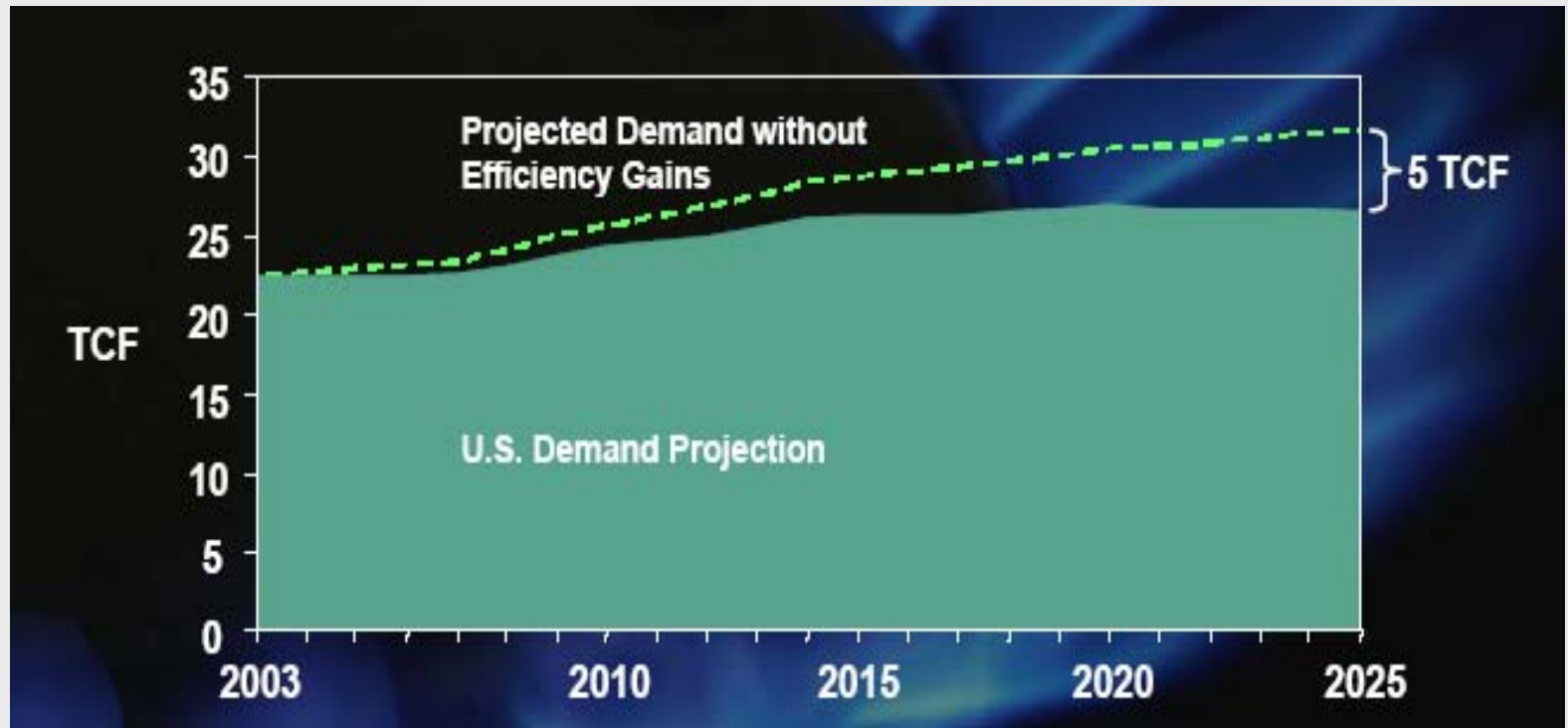
Why Should States Care About Natural Gas Energy Efficiency?

- > Jobs and Economic Development in your State
 - One of the biggest expenses of heavy manufacturing and industry is energy
 - Natural gas is the energy source for most industrial processes
 - More efficient and cleaner processes, in part, can create healthy, cleaner and more cost effective operations thus helping to keep jobs in your state

Why Should States Care About Natural Gas Energy Efficiency? cont.

- > Reduced Natural Gas Consumption
 - In many states electric power production is increasingly coming from natural gas
 - Less consumption by residential, commercial and industry means less demand and potentially lower prices for natural gas used in the production of electric power
- > Opportunity for rate payer and low income programs deploying high-efficiency gas equipment coupled with other efficient technologies to reduce overall energy costs to consumers.

Importance of Efficiency



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What is 5 TCF

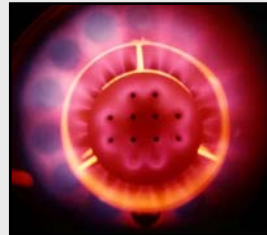
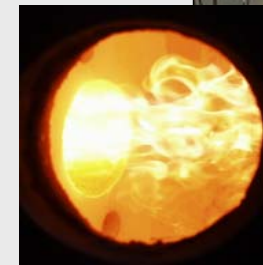
- > 5 TCF is enough natural gas to meet the entire need in Illinois including, industrial, commercial, residential and power generation over a 5 year period

How GTI is Reducing Natural Gas Demand and Improving Emissions

- > Improved combustion and heat transfer
- > More efficient residential/commercial appliances
- > More efficient cooling/dehumidification systems
- > Cleaner and more efficient industrial systems/processes
- > Cleaner and more efficient distributed energy and CHP technologies
- > Advanced transportation/vehicle technology

Advanced Industrial Burners

- > Methane de-NOX
 - Co-fire gas with solid fuels
 - Up to 70% NOx reduction
- > Hi-Luminosity Burner
 - Boosts glass-furnace production, efficiency
- > A dozen other burner systems...



Building Cooling/Heating/Power

- > BCHP technology integrates space conditioning and power systems
 - Yields efficiency, emissions benefits
- > GTI optimizing three systems:
 - Waukesha engine/
Trane absorption chiller
 - Capstone microturbine/
Broad absorption chiller/
Takuma chiller
 - Cummins engine/
Munters desiccant



Commercial Food Service

> Advanced Conveyor Oven

- For pizza restaurants
- Advanced internal airflow
- Higher efficiency, product quality

> Steam Generator

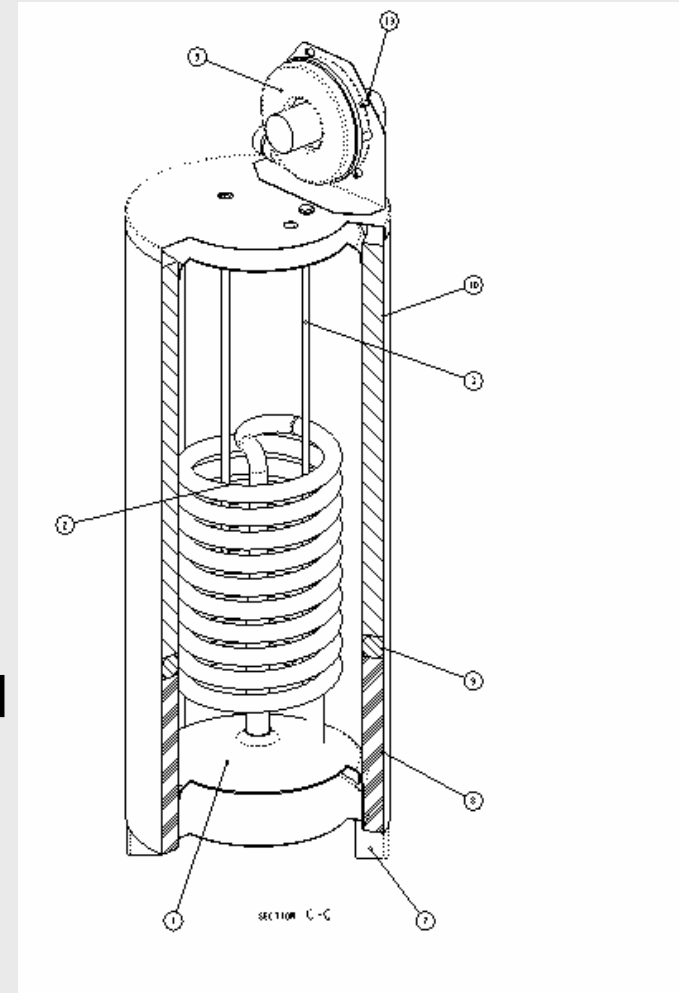
- For steam-based cooking units
- 'Falling-film' heat transfer
- No boiler
- Insensitive to water quality



Residential

R&D Condensing Water Heater

- > Key Features: Porcelain coated low-carbon steel heat exchanger
- > Applications:
 - Combo water/space heater for low-income residential –
 - target installed cost - \$1,950 (92%) vs. \$2,210 (80%)
 - Water heater for residential and Small Commercial
- > Benefits: 50 gal.; Efficiency of over 92%



Cooling/Dehumidification

> Small Absorption Chiller

- Testing 5-ton Cooltec unit
- California demonstration planned



> Residential Dehumidifier (desiccant-based)

- Laboratory-testing several units
- 100-unit Florida field test planned
- Assist with installation, monitoring

Modular Power Systems

> Distributed Generators

- ONSI 200-kW fuel cell
- Capstone, Ingersoll-Rand microturbines
- Caterpillar, Cooper reciprocating engines
- GE/Zenith grid-interconnect gear



> Software for Economic Analysis

- D-Gen Pro
- Building Energy Analyzer

Value of R&D to Improve Efficiency of Gas Use

- > Extends current gas supplies
- > Helps end-users control energy costs
 - Improves industry's competitiveness
- > Helps reduce combustion emissions

The R&D Future: GTI's View

- > Gas industry is moving away from broadly funded, comprehensive natural gas energy efficiency RD&D
- > Some gas companies and states are stepping forward to establish and support collaborative, industrial and/or natural gas R&D programs (New York, California, Ohio, others)
- > More State initiative encouraged
 - Natural gas supply and demand (cost) critical to States' economies
 - Natural Gas cost often discussed but few energy efficiency or supply improvement plans being developed or supported.

Models for State Collaborative RD&D

- > California, California Energy Commission (CEC)
 - > New natural gas system's benefit charge
 - > Renewables, Energy Efficiency, Building Systems, DG and CHP
- > New York, NYSERDA
 - > Major support for improved industrial processes, Energy Efficiency, Renewables, DG & CHP
- > Texas, TERP
 - > Advanced mobile emission reduction technologies
- > Illinois
 - Illinois Clean Coal Institute (ICCI)
 - > Support for advanced clean coal and syn gas technologies
 - IDCEO
 - > Renewables, Energy Efficiency
- > Ohio
 - Ohio Department of Development (ODOD)
 - > Fuel Cells, Industrial Processes, Coal and Energy Efficiency

Developing RD&D and Programs

- > GTI encourages state-level programs to promote development and deployment of more efficient natural gas technologies
- > GTI is ready to engage your State to discuss developing a natural gas energy efficiency RD&D program focused on your State's industries and/or needs
- > Natural Gas Issues of Potential Importance to Specific States
 - Infrastructure Surety, Coal Bed Methane, Exploration and Production, LNG, Biomass and Coal Gasification

Summary

- > Natural Gas will continue to be a critical energy source for many industrial, commercial and residential customers and for electric power generation well into the foreseeable future
- > Natural gas is a clean and reliable source of energy
- > Natural gas consumption will grow and the commodity will continue to be in high demand
- > Demand for natural gas in the power generation sector will continue to grow
- > Robust programs to reduce demand and/or increase supply, over time, can make an impact
- > Natural gas energy efficiency is one way to reduce demand for natural gas and improve economics for industrial, commercial residential and power generation customers
- > GTI is improving natural gas efficiency and reducing environmental impacts in a variety of industrial, commercial and residential and power generation applications.

Contact GTI

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