

Team Green Makes Progress

Natural gas utilities are sponsoring R&D to reduce greenhouse gases and improve efficiencies.

LEADERS IN THE natural gas industry have long recognized the value of cooperative research and the fact that some of the industry's most significant concerns—including the need to reduce greenhouse gases and improve energy efficiencies—are best addressed through a coordinated effort of a team of stakeholders.



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Above: The GTI-designed burner installed in a standard wok range was tested and shown to cook several typical Asian dishes as well as the typical wok-style burner, while consuming less than half of the volume of natural gas. Above right: A LEED (Leadership in Energy and Environmental Design) house in Columbus goes solar with the installation of Solar Usage Now. The collector is an Apricus AP30.



Through cooperative initiatives, the industry can tackle the complex challenges that typically require creativity, a variety of perspectives, technical expertise and multi-source funding.

This philosophy is the foundation of Utilization Technology Development (UTD), a not-for-profit company comprising leading

North American natural gas distributors that pool their funds, resources and expertise to support research, development and deployment (RD&D) activities focused on the efficient and clean use of natural gas.

A Growing Effort

Established in 2004, the current 12-member organization (representing nearly 20 million natural gas consumers in 31 states

and Canada) directs and sponsors a wide-ranging program—often in collaboration with government entities—to enhance the use, reliability and efficiency of natural gas appliances, industrial systems, commercial cooking equipment, alternative vehicles and other end-use technologies.

In 2008, UTD invested more than \$3 million to help reduce emissions, improve efficiencies and enhance the use and reliability of natural gas equipment in all market sectors. UTD members develop the program, choose the projects (currently more than 45 individual efforts) and interact with AGA, Gas Technology Institute (GTI), manufacturers and other organizations such as the Energy Solutions Center and the Council for Responsible Energy to ensure that efforts are targeted in a coordinated, cohesive manner.

“A key benefit of UTD,” says Susan Davis, director of marketing for Questar Gas Co. and chair of the UTD board in 2008–09, “is that a member company can channel its support into projects of specific interest in its specific territory. Sponsors can participate in testing activities within their own service area and develop first-hand knowledge of new technologies. But even more important is that, through UTD, companies with common concerns are linked in cooperative ventures. This strengthens the effort, leverages funding, increases the chances for success and helps to spread the benefits.”

In recent years, a growing portion of UTD's program has supported R&D to improve energy efficiency and contribute to the reduction of greenhouse gases.

“Our support is much more than an expression of positive corporate environmental action,” Davis explains. “It also makes good business sense. Through cooperative R&D we can improve the products our customers

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use, enhance the competitiveness of gas-fired equipment and develop new alternatives that use gas as the energy source. The end result is more efficient equipment and reduced emissions.”

Environmental Benefits of Direct Natural Gas Use

Natural gas utilities have traditionally targeted consumer education efforts on the benefits of natural gas in areas where gas products provide cost, control or performance advantages. Today, educating consumers about the “green benefits” of natural gas—and reminding the public that natural gas is the cleanest and greenest of all fossil fuels—is a major part of most utilities’ communications.

“UTD is a key source for the development of information and products for those companies,” Davis says. UTD supports the operation of the Carbon Management Information Center (CMIC), an online source (www.gastechnology.org/CMIC) for data development and exchange with a focus on promoting the environmental advantages of natural gas. Research

results from the UTD program help to build the CMIC’s extensive database of information.

“The public perception is often that natural gas is part of the carbon problem, not part of the solution,” says Davis. “However, natural gas provides the least-cost option for major reductions in carbon emissions compared with electric and oil equipment on a full fuel-cycle (‘source-to-site’) basis.”

A significant portion of UTD’s development activities are devoted to the direct use of natural gas. As cited in a 2008 American Gas Foundation report, increases in the direct use of natural gas help to reduce carbon emissions by displacing less efficient and higher carbon-emitting processes. A follow-up analysis by GTI indicates the potential for the natural gas industry to reduce more than 370 million metric tons of carbon emissions annually and save more than 3.5 quadrillion Btu of energy.

Reductions come through simple, near-term steps, such as using natural gas in place of less efficient electric processes (e.g., water heating in the residential and commercial sectors)



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—SUSAN DAVIS, UTD BOARD CHAIR

that have been driving up U.S. carbon emissions steadily for many years (see *figure*). Additional greenhouse gas reductions can be derived through improvements in natural gas appliance efficiency and the development and maturation of hybrid natural gas/solar thermal energy systems.

UTD has been particularly successful in the development of commercial foodservice equipment that provides improvements in energy efficiencies that translate into reduced emissions.

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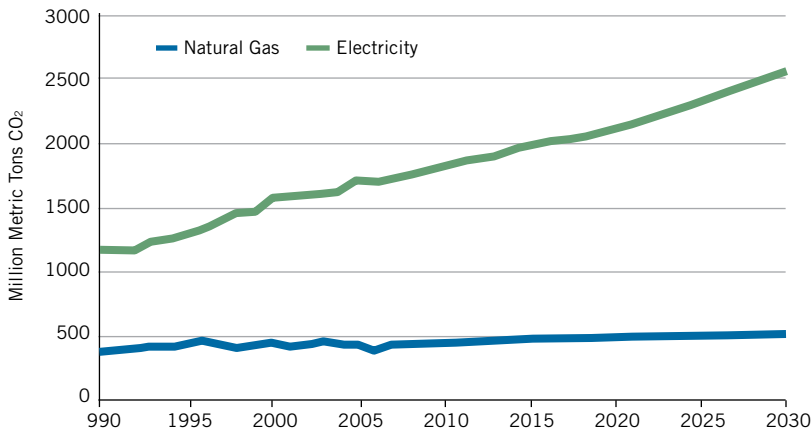
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RESIDENTIAL AND COMMERCIAL CARBON EMISSION TRENDS



SOURCE: DOE/EIA-GTI

Products either available or soon to be on the market include:

- >> A compact gas-fired countertop steamer that offers enhanced cooking rates while providing users with energy and water savings.

- >> A combination oven (able to operate in various cooking modes, such as baking, steaming, roasting, poaching and reheating) for improving cooking performance, quality and efficiency.

- >> A new wok burner system that increases efficiency by more than 100 percent (compared with current products) while improving kitchen comfort by lowering ambient temperatures.

- >> A new low-oil-volume fryer that increases energy efficiency while also extending cooking oil quality and life to provide significant customer savings.

Pursuing Improved Efficiencies and Reduced Emissions

UTD representatives note that the organization is committed to improving the energy efficiency and reducing the carbon footprint of gas-fired equipment while “pushing the envelope” to develop technologies that meet or exceed regulatory and consumer expectations for environmentally conscious technologies. UTD and its research partners work closely with manufacturers, government agencies,

AGA, the Energy Solutions Center and other industry groups to develop high-efficiency hot water systems, space-heating solutions, commercial foodservice ovens and fryers, steam generation systems and other next-generation products.

For the industrial market, UTD has been supporting the development of ultra-high-efficiency commercial and industrial boilers and heat recovery systems. This includes the “Super Boiler,” a revolutionary firetube boiler that has completed more than two years of testing at a

Utilization Technology Development Member Companies

- Alabama Gas Corp.
- APGA Research Foundation
- Atmos Energy Corp.
- Enbridge Gas Distribution
- LA RDC (Atmos Energy, CenterPoint Energy and Entergy-Louisiana Consortium)
- National Fuel Gas Distribution Corp.
- National Grid
- New York State Electric and Gas Corp.
- Oklahoma Natural Gas Co.
- Piedmont Natural Gas Co. Inc.
- Questar Gas
- Southern California Gas Co., a Sempra Energy utility

manufacturing plant in Alabama. Demonstrations also are being conducted at a bottling plant in California, with additional field tests planned in various locations.

At the heart of the Super Boiler is a new approach for recovering waste energy and water from natural gas exhaust systems. The technology, called the Transport Membrane Condenser (TMC), acts like an “energy sponge” to capture from the exhaust otherwise wasted energy, along with clean water. This helps boiler operators save energy and expense for fresh water. Activities are being conducted to apply the TMC technology in other applications such as industrial food drying and residential space heating.

Studies estimate that the advanced TMC waste heat recovery systems—when applied to commercial and industrial boilers—could provide an annual U.S. energy savings of \$1.5 billion, avoiding more than 18 million tons of CO₂ emissions.

For the residential market, plans are under way to develop and test a prototype gas-fired Hybrid Optimized Tankless (HOT) water heater to provide improved energy efficiencies and lower emissions. Currently, storage water heaters are the dominant system approach for domestic water heating in residential applications, with a small—but growing—market share for compact tankless water heaters. Like all technologies, tankless water heaters have some room for performance improvement. The goal of the HOT water heater is to enhance the performance and incorporate the strengths of both tankless and storage water heater designs to provide high efficiency without compromising reliability, safety or performance.

Expanding the use of natural gas vehicles also can generate additional greenhouse gas savings. UTD has sponsored field testing, evaluation and demonstration activities to enhance the performance of engines for

natural gas-fueled trucks and buses. Through technology improvements, the Cummins Westport Inc. 8.9L ultra-low-emissions engine became the first engine certified to the highly stringent California 2010 standards for heavy-duty vehicle engines.

The Hybrid Use of Natural Gas

UTD also is investigating the use of natural gas in combination with other energy sources to provide overall cost savings and environmental benefits.

Researchers see significant potential for efficiency improvements in several applications by integrating solar-related technologies with natural gas-fired equipment. Under UTD sponsorship, marketing and engineering studies are under way for the development of solar-assisted, natural gas-based systems for hot water and steam generation applications in residential, commercial and industrial markets.

UTD research is being performed by GTI, Solar Usage Now LLC and a gas appliance manufacturer to integrate the solar-assisted option into gas appliances for domestic

water and space heating. A prototype heating system, called Equinox, has been fabricated for testing and consists of a 98 percent efficient, modulating-condensing flash heater; high-efficiency hot water storage; and pressure-free, environmentally friendly solar collectors. The system places special emphasis on water hygiene, with a design that eliminates the sediment and bacteria that are normally found in conventional storage tank systems. It also reduces and eliminates major components and associated costs (such as the solar storage tank) to provide a flexible installation and address the technical barriers that can inhibit market growth.

UTD also formed an alliance with SolFocus Inc. to advance a unique, higher-temperature solar collector and test loop. Typical solar thermal collectors use direct heat from the sun, concentrating it to produce heat at temperatures below 200°F. The SolFocus technology is able to produce heat at about 300°F, expanding its potential to be used in commercial, industrial steam and absorption-cooling applications.

Deployment and Industry Interaction

UTD’s involvement goes beyond research and development. “With an expanding network of interactions, UTD serves as an efficient conduit for field testing, prototype demonstrations, and validation and optimization of equipment for introduction to the market,” Davis says.

“In general, UTD will support a project through all of its steps, including deployment,” she continues. “Since deployment can be the most critical step, we support efforts to improve communications, develop industry interactions and address code issues where necessary. There are many opportunities for achieving energy efficiency improvements and carbon reductions with natural gas, and through the CMIC, the UTD program and other efforts, we can explore and promote these opportunities to benefit our customers.”

Editor’s Note: For more information, contact Greg Maxfield, UTD program administrator, at greg.maxfield@gastechnology.org or visit the UTD web site, www.utd-co.org.

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