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Greenhouse Gas Technology News

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NYSERDA & GHG Center Team-up to Verify Five New Energy Technologies

The GHG Center and the New York State Energy Research Development Authority (NYSERDA) have agreed to collaborate and share the cost of verifying several new energy technologies installed across New York under NYSERDA-sponsored programs. Five technologies are initially slated for collaborative verification in 2002. The list is still developing, but could include the new Ingersoll Rand Powerworks microturbine combined heat and power (CHP) system, the new Capstone microturbine CHP, a PlugPower residential fuel cell, and two waste gas-to-energy systems; one using a microturbine and one using a fuel cell CHP. Both of these latter technologies will use renewable biogas fuel generated from the anaerobic digestion of animal and human waste. Energy efficiency, emissions, and emission reduction verifications are planned for each.

"NYSERDA has assembled an impressive array of technology demonstrations in New York, and like the Center, they see the benefits of using credible verification data to show customers the environmental, energy, and economic benefits these technologies may possess" said Stephen Piccot, GHG Center Director. "The missions of NYSERDA and the GHG Center are well aligned, making collaboration on these technologies possible, and setting the stage for collaboration on other technologies in 2003 and beyond." David Kirchgessner, U.S. EPA's Project Officer for the GHG Center remarked "We're excited about this collaboration because we're always looking for ways to help States accomplish their environmental missions. In this case we can do that, and ironically, the State of New York is helping us accomplish our mission as well."

Richard Drake, NYSERDA Program Manager of Power Systems Research, will coordinate with the GHG Center on the five projects outlined above. "NYSERDA is an active participant in Governor Pataki's Greenhouse Gas Task Force. Our
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Three New Technologies Verified

Refrigerant Leak Detector

The GHG Center recently completed performance verification of the SLE-1001 Sight Glass Monitor (SGM) manufactured by KMC Controls, Inc. of New Paris, Indiana. Hydrochlorofluorocarbon (HCFC) and hydrofluorocarbon (HFC) refrigerants used in refrigeration and air-conditioning equipment have high global warming potentials, so even small amounts of refrigerant emissions from leaky components can have a significant impact.

Most commercial and industrial refrigeration and air-conditioning equipment includes a sight glass in the liquid line near the condenser outlet to visually monitor refrigerant conditions. A clear liquid in the sight glass during operation indicates that adequate refrigerant is present. Continuous bubbles in the sight glass indicate that the system is short of refrigerant, which can be caused by leakage. KMC developed the SLE-1001 Sight Glass Monitor (SGM) to measure and interpret refrigerant conditions at the sight glass. The SGM is mounted on an existing sight glass and continuously monitors for the presence of bubbles and/or moisture in the circulating refrigerant. When the SGM detects continuous bubbles and/or moisture, the monitor alarms, warning operators of a potential leak. This early warning provides an opportunity to repair the leak at an earlier stage than would normally occur, reducing emissions and financial losses from leaked refrigerant.

SGM Co-Inventors, (from left) Laurel Chapman and J. Norman Nevitt of Future Controls, Inc. Display KMC's Detector Module

The GHG Center verified the SGM installed cost, leak detection sensitivity, and potential refrigerant savings on a roof-top air-conditioning unit (75 ton cooling capacity)
(continued on page 2, see Verifications)

Verifications

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and water chiller (70 ton capacity) located at an actual commercial site in North Carolina. Interested readers may download the Test Plan, Verification Report, and Verification Statement from the GHG Center's Web site (www.sri-rtp.com). For additional information on the SGM, please visit KMC's Web site (www.kmc-controls.com).

Air to Fuel Ratio Controller For Gas-Fired Engines

The GHG Center recently evaluated the performance of the GECO 3001™ Air/Fuel Ratio Controller which is offered by MIRATECH Corporation of Tulsa, Oklahoma, and was developed by Woodward Governor Company, of Fort Collins, Colorado. The GECO Controller is an air/fuel ratio controller designed to improve performance of natural-gas-fired, four-cycle, lean-burn reciprocating engines by optimizing and stabilizing the air/fuel ratio over a range of engine operating conditions. The technology uses a closed-loop feedback system that automatically and continuously optimizes the air/fuel mixture introduced to the engine, providing the potential to improve engine fuel economy and reduce engine emissions, particularly when changes in engine load, fuel quality, or ambient conditions occur. Using exhaust gas O_2, intake air manifold pressure, intake air manifold temperature, and engine speed as primary indicators of engine operation, the GECO Controller continuously adjusts air/fuel ratios by adjusting and controlling fuel flow to the carburetor. Verification testing was conducted on a lean-burn internal combustion engine (Caterpillar Model 3516-LE), with a rated power output of 1,085 BHp. The verification quantified changes in engine fuel consumption rates, criteria pollutant and greenhouse gas (GHG) emissions, and oil degradation rates that occur with the use of the GECO Controller. Results can be obtained from the GHG Center Web site identified above.

Diesel Fuel Cleaning System

The GHG Center has recently evaluated the performance of the Enviro 4 Automated Fuel Cleaning and Maintenance System which is offered by JCH Fuel Solutions of N. Las Vegas, Nevada. JCH's Enviro System treats and cleans contaminated fuel prior to use and maintains the treated fuel while in storage. Facilities using diesel-fired engines often draw their fuel supply from central storage tanks, which can remain in storage for long periods (e.g., hospitals or hotels with emergency electric generators often hold fuel for extended periods before using it). Fuel can become contaminated during long storage periods, and according to the vendor, these contaminants alter diesel fuel properties and potentially harm engine mechanisms, increase wear, clog filters, and impact combustion quality and fuel use efficiency. The primary goal of this verification was to determine if a positive impact on emissions and fuel consumption occurs with the use of JCH's Enviro System. The verification determined emissions and fuel consumption rates for an Onan Model 200DGFC 200 kW genset using contaminated fuel. These tests were then repeated after JCH treated the same lot of fuel using the Enviro System. Results can be obtained from the GHG Center Web site identified above.

Enviro System Being Moved Into Position by JCH Staff During Testing

Policy Corner

U.S. Senate Considers CO_2 Trading Program

The Senate Environment and Public Works Committee is considering a plan for capping carbon dioxide emissions from motor vehicles that would allow emissions trading to occur between the transportation and electric utility industries. The plan, drafted at the request of the committee Chairman Jim Jeffords (I, VT), would impose a cap on automakers, and would target passenger vehicles first, followed by light-duty trucks, commercial fleets, and others. The plan is being received coolly by auto industry representatives, many which view the proposal as a back door to imposing stringent new CAFÉ standards that could significantly increase the cost of automobiles. The transportation sector represents about one-third of the national CO_2 emissions, and emission traders and some electrical utility groups have responded with interest, applauding efforts to include the transportation industry in any national effort to reduce GHG emissions.

EPA's Natural Gas STAR Program and GHG Center Team-up

Effort Begins With Oil Processing Sector Technologies

There are an estimated 252,000 natural gas production wells and 575,000 crude oil wells in the United States. Most of these operations produce large volumes of relatively low-pressure waste gas, a large fraction of which is methane. This gas can be either disposed of (e.g., vented or flared) or recovered and used. Disposal options are relatively easy to implement and can reduce hazards and toxic air pollutants. However, disposal options do not make use of the high-energy content associated with the gas, produce large volumes of GHG and other emissions, and when flaring is used, can lower the aesthetic quality of communities and generate nuisance complaints.

Carrie Henderson, Manager, Natural Gas STAR Program

On the other hand, vapor recovery units, or VRUs, can capture these Btu-rich vapors for use as an on-site fuel, pipeline-quality gas, or natural gas liquid. While reducing GHG emissions when compared to disposal options, VRUs can also provide financial benefits to site operators due to the recovery of previously wasted resources. However, operation of VRUs can be a costly and high maintenance option for some operators, making disposal options more attractive in many cases, particularly, when electrical power access is limited.

The Greenhouse Gas Technology Center (GHG Center), in partnership with EPA's Natural Gas STAR Program, plans to conduct an independent performance verification of a new vapor recovery system; the EVRU™ Vapor Recovery System, offered by COMM Engineering, USA. COMM Engineering voluntarily submitted the technology for verification in late 2001, and field verification of the system will now take place at a crude oil processing and storage facility operated in the U.S. by Total Fina Elf E&P USA, Inc. Planning for the verification is underway, and testing should begin by the summer of 2002. Performance parameters will be verified using measurements and other techniques, and will include determination of the average daily gas recovery rate, the total installed cost, and the annual natural gas savings and methane reduction.

The verification testing effort is being co-sponsored by EPA's Natural Gas STAR Program, which on behalf of the STAR Program Partners, is providing financial and other support. Carrie Henderson, EPA's STAR Program manager said "Partnering with the GHG Center is a good way to support our STAR Partners with credible data on new environmental technologies. The EVRU has the potential to benefit both site operators and the environment, and we look forward to working with the GHG Center to see how well it performs for Total Fina Elf. We also hope to support the GHG Center's efforts to verify other methane mitigation technologies in the future."

According to COMM Engineering, the EVRU is applicable to thousands of crude oil and condensate storage tanks in the United States. Considering typical oil and gas production facilities may produce between 50 and 300 MCF/day of hydrocarbon vapors from these tanks, substantial energy recovery and emissions reductions are possible. The EVRU is different from standard VRUs in that it uses a non-mechanical eductor device to recover and increase the pressure of low-pressure vent gas for use or sale. High-pressure motive gas is used to entrain the low-pressure vapors and discharge them at a higher pressure. The resulting gas stream can be used on-site as an engine fuel, or re-pressurized with a booster compressor and introduced into a natural gas transmission line for sale. High-pressure motive gas must be available for the unit to work, but most oil and gas production and processing facilities are equipped with high-pressure natural gas pipelines, providing a readily available motive gas source. The eductor has no moving parts, so maintenance costs may be low, and other than the motive gas, requires no outside sources of energy.

COMM ENGINEERING U.S.A.

NaturalGas EPA POLLUTION PREVENTER

GHG Center Conducts Verification Training in India

During the week of September 10, 2001, the Indian Ministry of Environment and Forests (MoEF), the U.S. Agency for International Development (AID), the U.S.-Asia Environmental Partnership (U.S. AEP), the U.S. EPA, and the Federation of Indian Chambers of Commerce and Industry (FICCI) sponsored Environmental Technology Week in New Delhi, India. The event included a two-day technology conference attended by high-level U.S. and Indian government officials and diplomats, a wide range of technologists, and others from across India. The event concluded with a two-day environmental technology verification training workshop attended by 65 representatives from industry, government, financial institutions, research institutions, technology suppliers, and the Indian media.

Indian Parliament Building in New Delhi

The training workshop, held at the request of the Indian organizations listed above, was developed and presented jointly by EPA's Environmental Technology Verification (ETV) Program and EPA's Office of International Activities. Presenters included Blair Martin from EPA's Office of Research and Development, Dennis Cunningham from EPA's Office of International Activities, Stephen Piccot from Southern Research Institute's Greenhouse Gas Technology Center, Gordon Bellen from NSF International's Drinking Water Systems Center, and Adam Abbgy from Battelle's Advanced Monitoring Systems Center. Training activities illustrated the major components of EPA's ETV Program, and included sessions on verification planning and protocol development, stakeholder process execution, verification testing and reporting, and quality assurance methods. Stephen Piccot provided performance results for a collection of technologies recently verified by the GHG Center, emphasizing technologies of particular interest to Indian constituencies (distributed generation, municipal solid waste utilization, advanced energy technologies).

Following the workshop, the participant group reconvened for a fifth day of private discussions focused on the development of a technology verification system for India, MoEF, FICCI, and many of the organizations represented during the Environmental Technology Week will likely play key roles in running this verification program. Consideration is now being given to continuing the training by conducting a practical hands-on verification, in cooperation with an Indian verification organization, of an advanced energy technology installed at an Indian industrial or commercial facility.

NYSERDA

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mission is to develop and validate the benefits of environmentally preferred options for electric power generation and energy use. We expect this collaborative program with the GHG Center to become an important element of fulfilling that mission" said Drake. Technology performance parameters planned for verification are listed in the adjacent table, along with a general description of the commercial and other sites that will host each verification. "Potential purchasers of these energy technologies would much rather have verification occur under real world conditions and at real commercial sites" said Piccot. "It's more difficult and costly to do research grade testing in the real world, and it is certainly more challenging for the technology vendors. But we want the customers of our verifications to place high value on GHG Center data, and hopefully use it to make more informed purchase decisions." Verification planning activities should begin in February, with verification testing, analysis and reporting activities continuing through 2002 and into 2003. At least two verifications should be completed by September 2002.

Verification Site and Technology	Verification Parameters
70 kW microturbine CHP firing natural gas and supplying hot water to a community center's hot water system.	1. Power output and quality, heat output 2. CO_2, CO, HC, and NO_X emissions 3. GHG and NO_X reduction estimates 4. Electrical, heat, and total efficiency
30 kW microturbine using anaerobic digester gas from a dairy farm animal waste management system.	1. Power output and quality 2. SO_2, CO_2, CO, PM, HC, and NO_X emissions 3. GHG and NOx reduction estimates 4. Electrical efficiency
Two 200 kW fuel cell CHPs using anaerobic digester gas from a municipal waste water treatment plant. Waste heat used in digesters.	1. Power output and quality, heat to digester 2. CO_2, CO, HC, PM, SO_2, NO_X emissions 3. GHG and NOx reduction estimates 4. Electrical, heat, and total efficiency
Two 7 kW residential-scale PEM fuel cells using natural gas. One may switch to CHP in 2002.	1. Power output and quality 2. CO_2, CO, HC, NO_X emissions 3. GHG and NO_X reduction estimates 4. Electrical efficiency
60 kW microturbine with heat recovery for desiccant drying and space heat. Grid interconnect is anticipated.	1. Power output and quality, heat output 2. CO_2, CO, HC, and NO_X emissions 3. GHG and NO_X reduction estimates 4. Electrical, heat, and total efficiency

ANNOUNCEMENT!

Planning To Demonstrate New Technologies For Use In……..?

- **Central Electrical Power**
- **Distributed Electrical Power**
- **Combined Heat and Power**
- **Oil & Gas Production, Transmission, Distribution**
- **Municipal & Other Waste Management (solid, liquid, animal)**
- **Large Spark Ignition & Diesel Engine Improvements**

Team-up With the GHG Center

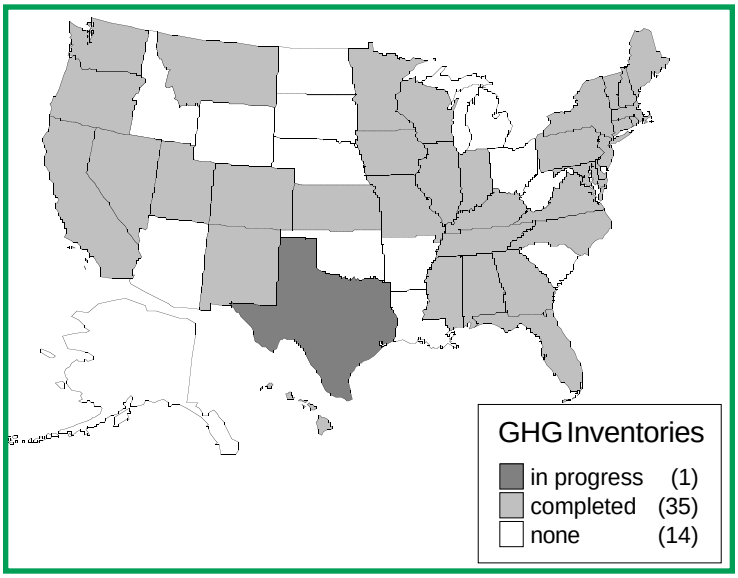
We May be Able to Help Plan, Manage, and Execute Your Performance Assessment Program, and Pay ½ the Cost!

Want to Learn More?

The GHG Center's mission is to perform independent third-party performance verification testing on technologies that reduce GHG emissions, then make that information available to technology purchasers, other stakeholders, and the public. The GHG Center is seeking vendors that believe EPA sponsored-verification testing would help increase the awareness and sales of their innovative and high-performance technology. We are also seeking partners with a mission similar to the GHG Center's, that want to partner on field verification testing. Interested parties can view and download all published GHG Center documents, and learn more about the GHG Center at our Web site (**www.sri-rtp.com**). The GHG Center Director, Stephen Piccot, can be reached at 919/ 806-3456.

Climate Change Mitigation at the Grass Roots

Many people believe that the summers are getting hotter, the winters are milder, or the weather is becoming more erratic. Average temperatures in parts of Hawaii and Colorado, for example, have risen more than 4 ^{O}F in the last century. Citizens, non-governmental organizations (NGOs), and communities are becoming concerned and are taking action at the state and local levels to mitigate GHG emissions. The perception is growing that appropriate environmental measures can create jobs, save money, and enhance the quality of life, all while addressing the public's concern with climate change. Stakeholders also realize that programs must originate at the local level because federal mandates are unlikely to occur in the near future.



Which States Have Initiated Action Plans?

Local actions are key components of the overall U.S. response to potential climate change challenges. Local efforts are gaining credibility, effectiveness, and acceptance through leveraging of resources between federal, state, and community agencies and organizations. The sheer number of initiatives can be daunting, so this article summarizes a few efforts, and explores their underlying concepts.

With assistance from the U.S. EPA State and Local Climate Change Program, two-thirds of the states have developed greenhouse gas (GHG) inventories, and about half have developed State Climate Change Action Plans. Regional plans are also emerging, such as the recently implemented climate action plan between New England states and eastern Canadian provinces. The content of these action plans ranges from generalized guidelines to specific regulatory, purchasing, and tax initiatives. The adjacent table summarizes some of the most popular types of programs. They are ranked in rough order of the number of states implementing the concept.

Responding to local pressure from a public that senses the climate is changing and an international response has begun, many local politicians are interested in taking some action. In February, the National Governors Association will host a workshop: Taking the Lead:Workshop on State Innovations to Reduce Greenhouse Gases, at the Hall of the States in Washington, DC. The GHG Center has been invited to participate in this event, which will emphasize mitigation strategies that reduce GHG while achieving other economic and air quality goals. Many states have passed the planning stage, like New York, Connecticut, California, and others that have technology demonstration and promotion programs well underway. For example, New York has committed about $21 million to demonstrate 50 high-efficiency combined heat and power technologies in the industrial, institutional, commercial, and residential sectors of New York. Although GHG reductions are not the main purpose, it is a key goal, along with reducing air pollution and alleviating electricity shortages.

State and Local Climate Change Program
State Action Plan Concepts

- *Industry energy use; demand-side management programs; state/local energy and physical plant purchasing programs*
- *Domestic/commercial building improvements; rehabilitation*
- *Alternative fuel vehicle fleet purchase*
- *Vehicle true cost allocation; changes in tax, registration, and inspection structures*
- *Renewable energy portfolio mandates; net metering*
- *Afforestation/sequestration*
- *Recycling/waste reduction*
- *Biogas; landfill methane utilization*
- *Agriculture efficiency improvements (e.g., tillage, fertilizer use)*
- *Enforceable/voluntary emissions inventories and trading programs*
- *Public education/outreach*
- *Coalbed methane utilization; pipeline fugitive leak controls*
- *Appliance efficiency standards; Energy Star participation*
- *Transportation mode shifts (e.g., HOV, light rail, intermodal freight)*
- *"Smart growth" initiatives (e.g., community development best practices)*
- *Telecommuting*

Contact the Greenhouse Gas Technology Center by calling Stephen Piccot at Southern Research Institute (919/806-3456), or David Kirchgessner at the U.S. EPA (919/541-4021). Additional information can be viewed on the GHG Center Web site at www.sri-rtp.com or the U.S. EPA ETV Web site at www.epa.gov/etv.