Issue 2 - 2004/2005

CANADIAN BOILER SOCIETY NEWSLETTER

THE CANADIAN BOILER SOCIETY MEMBER COMPANIES

ABB Inc.
ANRIC Enterprises Inc.
Aqua Chem Cleaver Brooks of Canada
Armour Valve Limited
Ashland Drew Industrial Div.
Babcock & Wilcox Canada
Bigelow-Liptak of Canada
Boiler Inspection & Insurance Co.
CH Ljungberg Inc.
Clayton Sales & Service
Enbridge Consumers Gas
Fireye Inc.
Fuel Master Burner Div, Pendell Boiler
Independent Metals & Alloys Inc.
Innovative Steam Technologies
Johnson Paterson Inc.
Klenzoid Co. Ltd.
KMW Systems Inc.
Le Groupe Simineau Inc.
Lipten Energy Canada Inc.
MBB Power Services Inc.
McRae Engineering Equipment
Miura Boiler Co. Ltd.
Quality Tube Supply Ltd.
Riello Burners
Superior Boiler Works Welding
Thermogenics
Union Gas
Vapor Power International
Waterloo Manufacturing Co. Ltd.
Weishaupt Corporation

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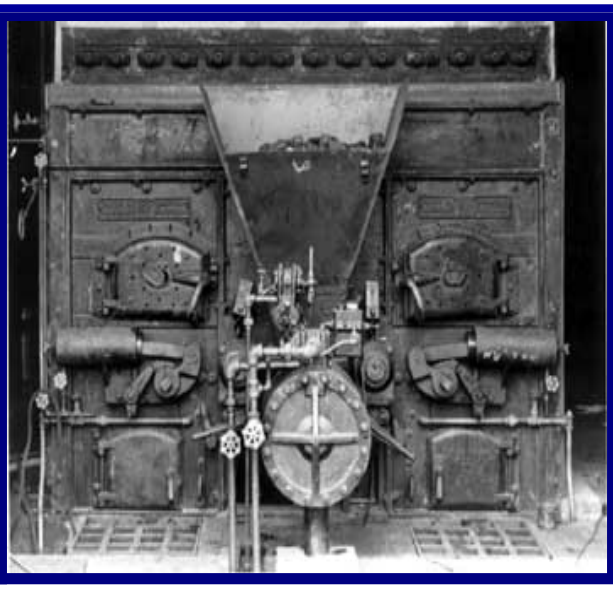
Editors: Ryan Tangney, Richard Barnes, David Duthie and Louise McColeman



In 1880, the year ASME was founded, there were 159 boiler explosions in the United States.

In ASME's first decade, more than 2,000 boilers exploded.

Such tragedies led the Society to institute uniform methods of testing boilers, in 1885.

For the full ASME Article, go to page 5

News from the President - Richard Barnes

The Canadian Boiler Society hosted a very interesting meeting at the CBS Offices on January 28, 2005. The focus of the meeting was the Safety Boiler. The CBS invited TSSA to present their approach on the development of rules that would reduce the requirements for attendance for Fire Tube and Water Tube Boilers. This meeting was limited to CBS members only.

Over the pass 12 months TSSA led a Risk Reduction Group (RRG) that was assembled under the direction of the Operating Engineers Advisory Council. The RRG consisted of representatives from a thermal plant consultancy, two boiler operators, and two fire tube boiler manufacturers, one of whom also manufacturers water tube boilers. The focus of the study was the reduction of supervised operation of the boiler. The approach taken was based on improvement of Safety and reduction of risk. There were three areas targeted for the improvement in Safety and reduction of risk; design and construction, operation and maintenance, and safety relief valves and failsafe devices.

These proposed regulatory changes have the potential for impact on member companies of the Canadian Boiler Society and it was felt that the CBS should have been involved in the discussions from the beginning. TSSA agreed that having the involvement of the CBS would be valuable. This meeting was the initiation of the CBS' input. It also provided the opportunity to have a complete update on the current position of what has been developed.

TSSA has been very open in correcting the oversight and as the CBS President; I thanked them for their openness. Mr. Rick Mile, Senior Operations Manager for TSSA thanked the CBS for arranging the meeting and expressed his appreciation for the good relations that have continued between the CBS and TSSA. He encouraged the members to provide their feedback on the presentation made by Mr. John Coulter and also encouraged all members to provide their individual organizations feedback.

Formal meeting notes are being finalized. If there are member companies that have not expressed their concerns directly to TSSA and would like to provide input in a formal letter to TSSA regarding any outstanding concerns, whether your company is in total agreement or completely against this issue, I encourage you to forward them to Louise McColeman as soon as possible so that the outstanding issues can be addressed. I would also like to thank all the participating member companies that attended this meeting. Your attendance contributed to its success.

Remember, the CBS AGM is scheduled for the first week in June. Membership attendance at these events contributes to the success of this society, please plan to attend. I look forward to seeing all of you at this annual event.

News from the Chairman — David Duthie

Since my last message, in the previous newsletter, I would like to report that the Canadian Boiler Society appears to be progressing significantly within the industry.

As always, membership input is integral to the success of this society. Additional members will add value and bring new ideas helping in the development of this society. Since the beginning of this year membership has grown and this society has become more worthwhile and created valuable opportunities for the members.

Most recently, the CBS hosted an all membership meeting with TSSA. There was a substantial turnout from both the CBS and TSSA. This presented the opportunity for TSSA to review, with the members, the plans and development for new boiler designs, fuel safety issues and agriculture regulations. The meeting was of great value in knowledge for no cost. The CBS will continue with this development and would like to present more information sessions as the opportunities arise.

The Annual General Meeting is fast approaching. The meeting will be held in Niagara Falls, June 5-7, 2005. The technical discussions will focus on boiler plant efficiency. There was a tremendous response to the FGM. Lets make the AGM just as successful.

To conclude, I would like to reiterate what an asset the website is for generating and promoting business for the Canadian Boiler Society Membership. Engineering Consulting organizations have approached me and made positive comments regarding our excellent site. There are many potential customers using the internet to search for business. The CBS website is at the top of the list on most search engines. We encourage all members

CBS EDITORIAL, OPINIONS & NEWS

New Member Company Profiles

CBS is proud to announce the following new Member Companies:

INDEPENDENT METALS & ALLOYS INC.
(CBS Contact - Pat Levesque)

Independent Metals & Alloys Inc. is a Manufacturer's Rep Sales Agency. Started in 1986, IMA's sales territory covers all of Canada.

IMA currently represents TEK Tube, Division of Fintube Technologies Inc. who manufacture **Welded boiler tube** to grades SA178A, A513 and A214. Size range is 1.250" to 3.00" OD to .065" to .165" wall. as well X-ID high performance boiler tube. This internally enhanced welded boiler tube provides up to 185% increase in heat transfer efficiencies over bare tubes.

As well, IMA represents Plymouth Tube Co. who is the *only* domestic source for carbon and alloy **Cold Drawn** and **Hot Finish** boiler tubes to ASTM A450 up to 5" OD. Value added services also provided are Four-Directional full body Ultrasonic Testing; Multi-Lead Ribbed (MLR) Tubing with rifled I.D.; Longer lengths up to 86 ft.; and Special end finishing available (chamfering, beveling). Both TEK and Plymouth offer short lead times. IMA also reps for Precision Coil Inc. who offer aluminum coil and sheet products.

UNION GAS
(CBS Contact - Ruth Dekker)

Union Gas Limited is a major Canadian natural gas utility that provides energy delivery and related services to about 1.2 million residential, commercial and industrial customers in over 400 communities in northern, southwestern and eastern Ontario. Its distribution service area extends throughout northern Ontario from the Manitoba border to the North Bay/ Muskoka area, through southwestern Ontario from Windsor to just west of Toronto, and across eastern Ontario from Port Hope to Cornwall.

The Company also provides natural gas storage and transportation services for other utilities and energy market participants in Ontario, Quebec and the United States. Union's storage and transmission system forms an important link in the movement of natural gas from Western Canadian and U.S. supply basins to Central Canadian and Northeast U.S. markets. Union Gas has assets of approximately $4 billion and employs about 2,200 people. Union Gas is a Duke Energy Company.

On behalf of all Company Members of the Canadian Boiler Society, we would like to welcome you and look forward to building new relationships and networking contacts.

FGM 2004 Cambridge, ON

The Fall General Meeting was a great success. It was held in October 2004, in Cambridge, Ontario.

The theme was **Energy Audits**. The presentation was delivered by Bob Griffin of our member company Enbridge Consumers Gas. The CBS would like to thank Bob for his contribution at the 2004 FGM.

The Business Meeting was held at the Galt Country Club and the tour was hosted by our member company Babcock & Wilcox Canada. The CBS would like to thank Yvette Amor, Lee Lama and Babcock & Wilcox Canada for offering their time and facilities to our members and colleagues.

BOARD OF DIRECTORS

President	Mr. Richard Barnes
Chairman	Mr. David Duthie Membership Committee Chair
Vice-Chair	Mr. Bryan Heppell
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Member	Mr. Ryan Tangney Communications Committee Chair
Member	Mr. Frank Morrison
Member	Mr. Lee Lama

All members are welcome to vote and participate on the Board of Directors! The board of directors encourages you to become actively involved with the issues that concern you. Please feel free to contact the board members at any time!

Annual General Meeting 2005 - Niagara Falls, Ontario

THE EVENT

The Annual General Meeting 2005 is scheduled for **June 5-7, 2005** in Niagara Falls, Ontario. The Theme or this AGM is **Boiler Control Systems & Equipment Optimizing Efficiency**.

THE HOTEL

The AGM will be held at the Sheraton Fallsview Hotel. It is a four-diamond hotel and is located 300 yards from the Falls. The hotel is in walking distance to the new **Niagara Fallsview Casino** and all guestrooms **overlook the Falls**. The room charge has been negotiated for a special rate of **$149.00 per night** plus applicable taxes. A block of rooms has been set aside for a short period so please **book your room today, you don't want to miss out!** All registrations must be made with the hotel Directly. Please call the hotel's toll free number **1-800-618-9059** and refer to the Canadian Boiler Society's Block of rooms when booking. The rooms will be released May 6, 2005. Any bookings after that date will be at full price.

THE TOUR

The tour will be hosted by **TRENERGY** on June 6, 2005. Trenergy is a build-to-print shop servicing the majority of Boiler OEMs and Boiler Designers. Their product offering includes: ASME Section I vessels such as HRSG drums, boiler drums, panels, superheaters, reheaters, headers, economizers, and assembled package boilers; ASME Section VIII vessels such as waste heat boilers, feedwater heaters and heat exchangers; and Non-Code vessels such as condensers and tubular air heaters. Trenergy is located approximately 15 minutes from the hotel.

This is a tour you do not want to miss!

THE GOLF TOURNAMENT

The golf tournament will be held at the Legends Golf Course which is approximately 10 minutes from the hotel. **The Legends Golf course is rated Five-Stars** and is the first of its kind in Canada. The Legends has two 18 hole

championship courses and one 9 hole short course. There is a putting course and a **Firing Range** which is a majestic 45 acre, 360º practice facility. This world class facility features a wide range of bunkered target greens and fairways making it easy to recreate different golf course conditions and make your practice more meaningful. Along with its stunning natural layout, "The Firing Range" has 6 well-manicured turf tee areas, practice bunkers and chipping areas. Every

player will have the opportunity to warm up on the Firing Range before tee-off. The Legends was designed by renowned architects Thomas McBroom and Douglas Carrick.

THE BUSINESS MEETING

The meeting will be held on June 7, 2005 followed by presentations. The presentations will cover the following topics; Boiler Control Systems, Economizers, Blowdown Heat Recovery, and Deaerators.

This 2005 Annual General Meeting is going to great. Niagara Falls is an exhilarating place to visit. **Mark your calendar today!**

Further details to follow!

FEATURE ARTICLES

THE TRUE HARNESSING OF STEAM

A club of professional men in New York City became America's mechanical brain trust.

by John Varrasi, ASME Public Information Department, ASME ME Magazine

In April 27, 1865, the steamship *Sultana* was chugging up the Mississippi with more than 2,200 people on board. At 3 a.m., with the boat situated about seven miles north of Memphis, Tenn., three of the four boilers powering the craft exploded. The violent explosions caused a fire, and within 15 minutes the *Sultana* burned to the waterline. More than 1,500 people died.

The cause of the explosion was never determined, and a nation far too preoccupied with post-Civil War reconstruction and rising industrialization cared little about a full-scale investigation. Since consistent operating guidelines and inspections for steam pressure systems were virtually nonexistent in this period of frenetic industrial activity and commercialism, many boilers in use were unsafe.

Although it remains the worst maritime disaster in the nation's history, the *Sultana* explosion was not an isolated incident in the United States. Boiler explosions occurred with alarming frequency, not only on board steamboats, but also in factories, mines, sawmills, and woodworking shops. There were 441 explosions during 1867–1868, according to *History of the ASME Boiler Code* by Arthur M. Greene, Jr.

One hundred fifty-nine boiler explosions occurred in 1880, the year that a small group of men assembled in New York City to found the American Society of Mechanical Engineers.

Modest Objectives

Legend has it that the group came together expressly to address the problem of unsafe boilers, but the initial objectives of ASME were modest. The founders were seeking a reliable system for technical information exchange as well as a social setting. The organization was established as a union of men with like-minded interests and career pursuits—a professional club patterned after the political leagues, auxiliaries, and other institutions that were common in American cities at the time. ASME's founders desired the same level of specialized professional standing available to civil engineers, who formed the American Society of Civil Engineers sometime in 1852, and to mining engineers, who organized the American Institute of Mining Engineers in 1871.

ASME's founders were prominent machine builders and technical innovators. Erasmus Darwin Leavitt, Jr., invented more than 50 gears, pumps, and other mechanical components, and advanced the understanding of economic efficiency in pumping engines. Henry R. Worthington was another pump engine designer, who built the first duplex waterworks engine and went on to found the Worthington Pump Co. in New York City. Francis A. Pratt patented milling and gear-cutting machines and, together with Amos Whitney, created an engine manufacturing company that remains in business today. Alexander Lyman Holley, the Society's first chairman, built steel plants from Chicago to Troy, N.Y., and came to be known as the father of American steel manufacturing.

Holley and Robert Thurston, ASME's first president, were the guiding lights of the fledgling organization. Beyond seeking an improved method of information exchange, Holley and Thurston were passionate in promoting mechanical engineering as a truly sophisticated body of scientific knowledge and as an engine for America's industrial development.

ASME's 1906-60 headquarters, at 29 West 39th Street in New York City.

Boilers at the Base

As ASME developed during the early 1880s, an increasing number of boilers were manufactured and installed to meet the needs of factory production and the fledging oil and steel industries. By 1890, there were some 100,000 boilers in service in the United States.

While boiler systems proliferated and became indispensable to the rapidly industrializing nation, unfortunately, they were not much safer. The boilers were becoming increasingly lar-

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ger and more complex, and in the absence of consistent operating guidelines many users cranked up the pressure ratings in an effort to produce additional work. The steam pressure rating for a prime mover in 1890 was typically set at 80 psi, compared to 30 psi in 1850.

In ASME's first decade, more than 2,000 boilers exploded. When a fire-tube boiler in a Brockton, Mass., shoe factory exploded on March 10, 1905—killing 58 people and causing property damage in excess of $250,000—a public outcry ensued. Following yet another deadly incident in Massachusetts in December 1906, local government officials there called for immediate action.

In those years, the U.S. government was reluctant to legislate rules and regulations for industry, so the job of standardization fell to the private sector and trade groups. Even before ASME was established in February 1880, the founders wrote papers outlining the symbiotic relationship between technical standards and a rational industrial order.

They recognized the need for standard tools and machine parts, and uniform work practices ensuring reliability and some measure of predictability in machine design and mechanical production.

The Society's founders discussed standards for screw threads, and pump and valve dimensions during the organization's first meeting and, by 1885, were considering uniform methods of testing boilers.

Six months following the incident in 1906, ASME assembled a five-person Board of Boiler Rules, which drafted a brief document that was endorsed by the Massachusetts legislature. The rules specified pressure limits on boilers (cast-iron systems were limited to 25 psi) and included guidelines for the performance characteristics of plugs and rivets.

In 1914, ASME produced the first edition of the Boiler Code, *Rules for the Construction of Stationary Boilers and for Allowable Working Pressures*. The formation of the code was no smooth process. Some engineers and company officials derided the code, complaining it was too regulatory or overly complicated. Some manufacturers of boilers were opposed to limitations on steam pressure. Several railroad managers who protested against the ASME effort sought a different set of inspection requirements than those established for stationary systems.

A Philadelphia engineer involved in boiler manufacturing, John C. Parker, was vehement in his opposition to the code. In a letter to the Society in 1914, Parker expressed a strong protest against further backing of the propaganda for state control of boiler design, and went on to accuse ASME of devious and underhanded dealings and attempts to sabotage his company as well as others.

Perfect Timing

Yet, for American industry, the timing of the Boiler Code was perfect. At the turn of the century, boilers of various sizes and performance capabilities were entering the marketplace, including in the power stations of New York's subway system. In addition, advances in materials were allowing the design of boilers featuring superheated steam capability. Mass production of boilers was in full swing.

The publication of the first ASME Boiler Code in 1914 was a symbolic moment in the history of the Society, an event that would help define the organization and contribute to its stature and importance in the mechanical engineering community for decades to follow.

Ninety years later, the Society today has approximately 3,400 active volunteers working on committees that combine to issue more than 600 standards. The standards detail the proper dimensions of a wide range of manufactured objects, from pressure vessels and piping to screw threads. However varied they are, they serve a single purpose: to make sure that all the pieces fit and hold together safely, even under pressure.

Pressure vessel and boiler code books from 1946.

Energy Bursts

written by Editor Jeffrey Winters
ASME ME Magazine

Lignite My Fire

Lignite occupies a niche somewhere between hard, black coal and crumbly peat. Pound for pound, lignite has half the energy content of anthracite, and it often has a high moisture content. But while it is far from ideal as fuel goes, it does get burned. In the United States, there are 35 power-generating stations that depend on lignite.

Now lignite may get a leg up. In June, the US Department of Energy kicked off the testing of a new system designed to use waste heat from a Continued on page 7

power plant boiler to remove moisture from lignite and other soggy coal before burning. The hope is that the drier fuel will burn hotter and cleaner.

The testing project, part of the national Clean Coal Initiative, will be conducted by Great River Energy of Elk River, Minn., at its Coal Creek Station in North Dakota.

First, a prototype module will be designed to dry about one-sixth of the coal fed to a 546-megawatt unit. Once the prototype runs successfully, the company will perform full-scale, long-term operational testing. The coal will be dried to various moisture levels, the full effects of coal drying on plant performance will be measured, and optimum operating conditions will be determined.

North Dakota lignite typically contains about 40 percent moisture. By drying the lignite first, the researchers expect to lower the moisture content by at least 10 percentage points, resulting in an estimated 2.8 percent to 5 percent efficiency improvement in the plant. This could translate into 25 percent less emission of sulfur dioxide, and 7 percent less of mercury, carbon dioxide, nitrogen oxides, and particulates per unit of electricity output.

Low-grade lignite in Montana, North Dakota and Texas makes up 10 percent of U.S. coal reserves.

Fueled by Flowers

Nothing says "eco-friendly" like a big, bright sunflower. And now researchers in England think they've discovered a way to make automobiles greener by powering them with hydrogen derived from sunflower seed oil.

Valerie Dupont, an engineer with the University of Leeds in England, and her colleagues have developed a hydrogen generator that processes sunflower seed oil—the kind found on supermarket shelves—together with air and water. The prototype device vaporizes the oil and water, then reforms the mixture with the help of nickel- and carbon-based catalysts to produce carbon dioxide, hydrogen, methane, and carbon monoxide.

The device is compact enough to fit on a standard laboratory bench.

In studies, the researchers achieved a hydrogen purity of 90 percent, which is more efficient than current hydrogen generators that only achieve a hydrogen purity of about 70 percent. The by-products of the sunflower oil transformation, carbon dioxide and methane, are generated in roughly equal proportions, the researchers say.

Ultimately, the researchers hope that the catalytic reactions will provide enough heat to drive the device. At present, electricity is needed to bring the generator to the correct temperature.

Such a device could one day fit under the hood of a car to generate hydrogen for fuel cells. One of the great stumbling blocks to developing affordable fuel cell-powered cars is the issue of hydrogen storage. Hydrogen can be stored much more densely in the form of vegetable oil than it can as a compressed gas.

Cars as Batteries

Utilities searching for innovative sources of peak power ought to look at their parking lots. Researchers at the University of Delaware and at Green Mountain College in Vermont suggest that electric vehicles could feed the grid while they are parked.

The concept, called "vehicle to grid" or V2G, is derived from the observation that cars used for commuting (as most autos are) spend most of their time sitting parked. The standard operating model for electric vehicles is that they would recharge during the evening, when electricity demand is down. During the day, however, they would sit unused in worksite parking lots.

Willett Kempton of the University of Delaware and Steven Letendre of Green Mountain College say that by adding a few hundred dollars worth of electronics, these sitting cars could be tapped by utilities during peak hours, drawing down individual car batteries by predetermined amounts and crediting car owners for the juice. Since electricity sells for a higher price during peak hours than at nighttime, car owners might profit from the transaction.

Kempton and Letendre estimate that such a scheme, executed on a wide scale, could supply as much as one-fifth of the nation's electricity needs by 2050.

Of course, it seems farfetched to suggest that enough people will be driving electric vehicles for V2G to have an impact, even by 2050. But the researchers say hybrids, which have a large electric component to their drivetrains, could be used as well.

Mighty Mite

Emergency generators—the kind used to run some household appliances during a blackout—now take up less space than a dishwasher. But what if you needed a generator just to run a cell phone? Engineers at the Georgia Institute of Technology in Atlanta now have an answer: a generator about the size

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of a sugar cube.

The microgenerator produces electricity much the way a gigawatt-scale power plant does. Magnets spinning near coiled wire induce an electric current. Coupled with a gas-microturbine to make an engine, the magnet turns some 100,000 times a minute to produce a little more than a watt of power.

Small world: This tabletop microgenerator produced enough power to run a cell phone.

At revolutions that fast, high-performance magnets tend to break under centrifugal pressure. The Georgia Tech team, led by Mark Allen, overcame this problem in part by sheathing the magnet in titanium.

Microgeneration is not a new idea, and research labs across the country have been working on small-scale devices for years. But the Georgia Tech team claims that theirs is the first microgenerator capable of powering a small electronic appliance.

The system is expected to provide power for a longer time than a similarly sized battery pack. The researchers project that a microengine system such as theirs could eventually produce as much as 50 watts—enough power to run a laptop. Sweet.

Waste into Water

Island communities have long been faced with a choice: scrimp on water or conserve electricity. That's because the desalination plants that could supply clean drinking water require lots of energy to run.

Now engineers at the University of Florida in Gainesville have developed a means of operating a desal plant by using waste heat from an electrical power plant. Rather than compete, both water and electricity can be made from the same fuel.

Desalination on a commercial scale involves either distillation—boiling saltwater and then condensing the resultant vapor—or reverse osmosis, in which powerful pumps force water through special membranes.

James Klausner, a professor of mechanical and aerospace engineering, developed an offshoot of distillation called mass diffusion. Pumps push saltwater through a heater and spray it into the top of a column stuffed with plastic slats. As the water trickles over the slats, warm air blows up through the column and evaporates the water. A condenser wrings the water vapor out of the blowing air.

Waste heat from power plants can be used to warm the water, Klausner says, cutting energy costs. Based on data from an experimental prototype, a diffusion desalination system hooked to a 100-megawatt power plant could produce 1.5 million gallons a day for about a quarter-cent per gallon.

Yukon Gas

As the battle over the status of the Arctic National Wildlife Refuge still rages, another Alaska wilderness has now slipped into the crosshairs of energy developers. In December, the United States Geological Survey released an estimate of oil and gas reserves in the Yukon Flats region that will likely lead to calls for opening up the area to prospectors.

Yukon Flats is a largely unsettled area about 100 miles northeast of Fairbanks; the territory lies within an 11-million-acre national wildlife refuge. The USGS assessed a 13,500-square-mile tract using new information obtained by recent field and laboratory studies.

The estimates of as-yet-undiscovered oil reserves in Yukon Flats was fairly low—only 173 million barrels. By comparison, the National Petroleum Reserve on the North Slope contains more than nine billion barrels. While the prospect of oil is probably too small to entice exploration at Yukon Flats, the gas reserves are thought to be more substantial. At an estimated 5.5 trillion cubic feet, the undiscovered gas reserves might be developed profitably. In fact, one of the areas studied lies within 75 miles of the Trans-Alaska Pipeline.

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