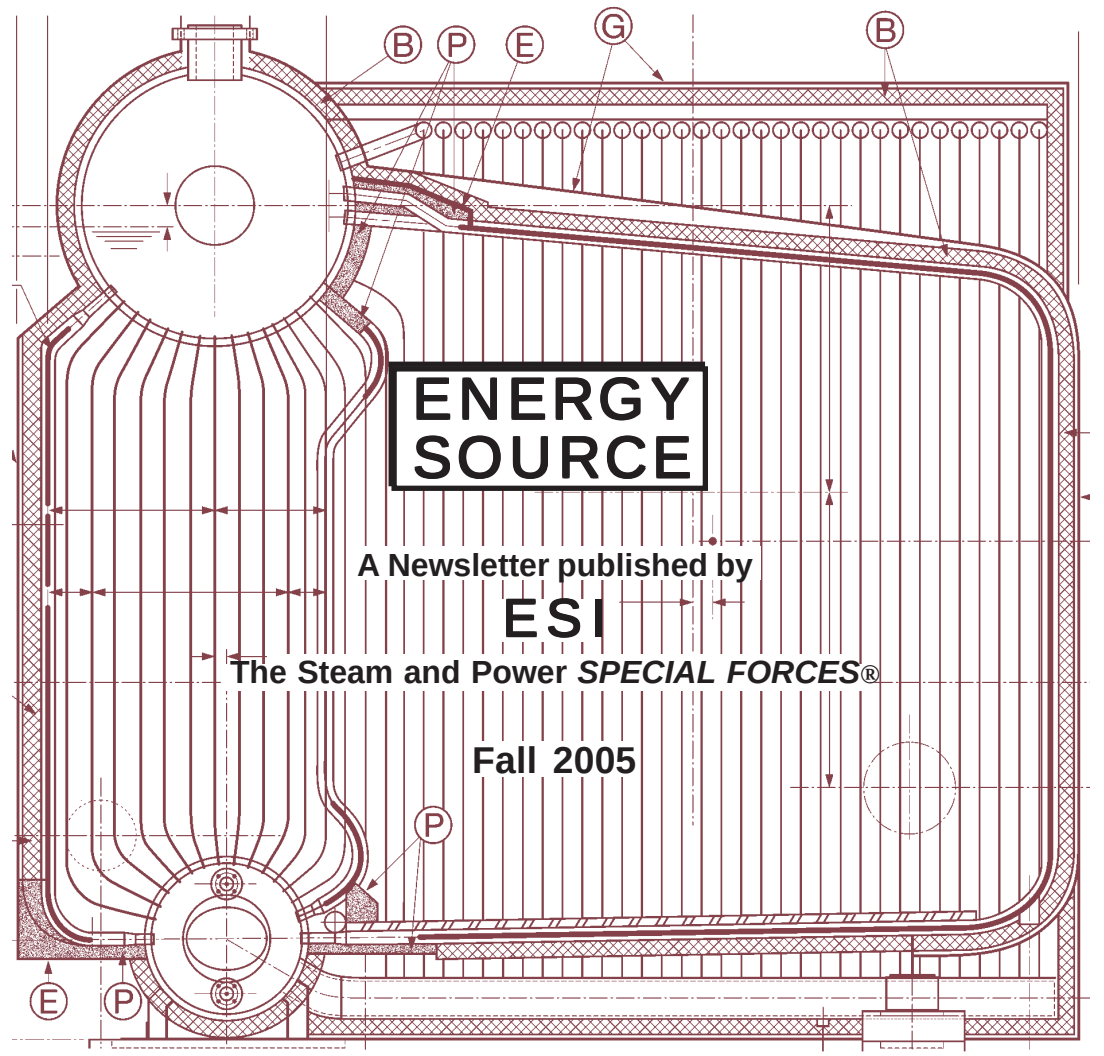


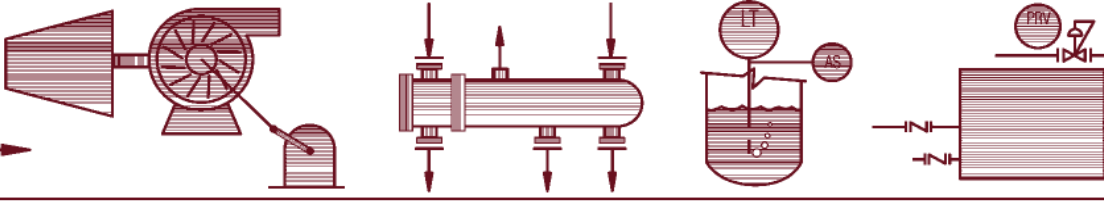
ENERGY SOURCE

A Newsletter published by

ESI

The Steam and Power *SPECIAL FORCES*®

Fall 2005



The Reason Why Natural Gas SHOULD NOT Be Your Fuel Of Choice!

By: William L. Reeves, P.E., President, ESI

Editor's Note: This article was written based on the article titled "The Problem with Natural Gas", by Frank Clemente, Senior Professor of Sociology and Energy Policy, Penn State University.

As I read the article by Frank Clemente, I gained a better understanding of the current and long-term supply and demand problems which have led to unprecedented prices for natural gas. The sad reality is that in 1987, with Congress's repeal of the Fuel Use Act which had previously prohibited the construction of new power plants firing natural gas, the United States embarked down a predictable path that has led us to the edge of the precipice. Excerpts from this article follow which help explain the current problem. If you would like to receive the entire article, "The Problem with Natural Gas" by Frank Clemente, which contains significantly more data to support the positions stated herein, please contact Jay Garrett with ESI at 770-427-6200 or jgarrett@esitenn.com.

In 1997, Joseph Riva, senior geologist writing for the Colorado School of Mines turned a skeptical eye toward the rapidly emerging dependence of the United States on natural gas (NG). Riva suggested that the rush to embrace NG as the primary fuel to meet incremental electricity and space heating demand was based more on sociopolitical hope than on geological reality. Noting that domestic NG production had peaked at 22.6 tcf in 1973, Riva questioned not merely whether the projected production of 25.5 tcf by 2015 could be met, but even whether the then current output of 19.8 tcf could be maintained. Basing his analysis on the level of known reserves and the rate of new discoveries, Riva argued that unless an unprecedented number of large fields were found soon, "by early next century, natural gas will have become more of an energy problem than an energy solution."

Subsequent events have provided ample support for Riva's grim assessment: (1) domestic NG production only reached 19.7 tcf in 2004, despite an additional 461 rigs in the field, an 82% increase over 1997; (2) NG well head prices have steadily escalated from $2.10 per mcf in 1998 to $6.31 per mcf in the first four months of 2005, an increase of $4.21 (200%); (3) chief U.S. policy makers (e.g., Alan Greenspan) now readily admit that the nation cannot meet its NG supply needs and will be increasingly reliant on imports from politically unstable areas, darkly paralleling our current dependence on foreign areas and the entailing socioeconomic costs. In essence, Riva's foretelling is coming to pass.

ENERGY SOURCE

The *ENERGY SOURCE* is published quarterly for customers, employees, and friends of ESI Inc. of Tennessee.

ESI is the Steam and Power *SPECIAL FORCES*® providing clients with innovative, cost-effective, and environmentally-friendly solutions.

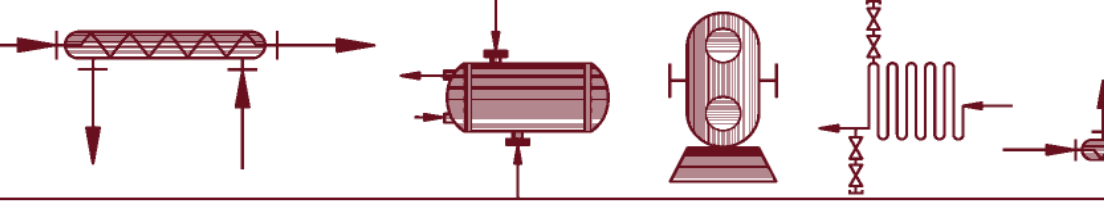
If you have any suggestions or comments about the newsletter feel free to call us at 770-427-6200 or e-mail us at energysource@esitenn.com.

Deanna White
Managing Editor

The Specter of Demand Shock

Given the status of NG as the cleanest of the fossil fuels, a confluence of environmental regulations, efficiency of combustion and simple convenience has led to an unprecedented build-out of the NG demand infrastructure, particularly through massive

Continued on Page 2



Natural Gas... *Continued from Page 1*

construction programs for power plants and new single-family homes. Yet, despite this increased dependence on NG to supply electricity and heat our buildings, the casual observer of business news would be hard pressed to find a systematic discussion of the commodity and the problems that loom on the horizon.

The stunning realization of the natural gas problem is founded in the following:

- **Construction of NG heated homes-** Throughout the 1970's and 80's, electricity was the preferred space-heating source for newly constructed single-family homes. In 1979, 51% of new homes were heated with electricity as opposed to 39% with NG. Over the past decade; however, NG has clearly become the fuel of choice in 70% of new homes with electricity dropping to 27%.
- **Construction of NG fired power plants-** The NG shortages of the 1970's prompted the passage of the 1978 Fuel Use Act (FUA) effectively banning NG fired electric power plants as well as the use of NG in large industrial boilers. These restrictions on NG consumption led to a substantial decline in demand and the eventual formation of a supply "bubble" which in turn resulted in chronically low NG prices. In 1987, much of the FUA was repealed setting off a surge in the construction of NG power plants. Indeed, NG consumption for electric generation rose from 2,636 bcf in 1988 to 5,352 bcf in 2004 (a 103% increase). In fact, since the 1990's, virtually all new power plants have been NG units in an historic departure from the traditional fuel diversification strategy of electric utilities. See Table I for additional details. In the past five years, over 200,000 MW of NG fired facilities have been added to the electric power system of the United States, the functional equivalent of 245 Calvert Cliffs Nuclear Units (825 MWe).

Table I. New Generation: NG Versus all Other Fuels

Period	New Generation Capacity (MW)	% NG	% All Other Fuels
2000-2001	66,200	95	5
2002-2003	110,500	96	4
2004-2005	29,426	90	10
2006-2010	21,513	86	14
Total	**272,429**	**93**	**7**

Table II. Projected Consumption Growth by Sector (bcf)

Sector	2004	2010	Increase	% Increase
Residential	4,957	5,524	567	11
Commercial	3,103	3,387	284	9
Industrial	8,188	9,046	858	10
Electric Generation	5,226	6,739	1,513	29
Other	664	737	73	11
Total	**22,168**	**25,433**	**3,265**	**15**

- **Demand Growth-** The demand growth of the United States from simple population growth will result in a 15% overall increase in NG demand over the next 6 years. Please see Table II for projected comsumption growth by sector.
- **Supply Constraints-** Constraints on other fuels to fuel new electric power plants has resulted in not only virtually all of the recent growth, but all of the forecasted growth in electric power plants to be met by NG. For the current entire decade, new capacity for coal, nuclear, hydro, and all other fuels combined will have provided only 7% of all new power plants while NG will fuel 93% of that capacity. This dramatically highlights the nation's increasing dependence on natural gas.

Continued on Page 4

“Natural Gas Prices Are Killing Us...”

“Natural Gas Prices Are Killing Us...” That is the comment ESI has heard numerous times in the last few months; however, customers seem to be hesitant to consider switching to solid fuel. Most are worried about the capital cost, operating and maintenance costs, and whether or not the solid fuel of choice could even be permitted. ESI has recently been involved in two projects that some might think were impossible to permit.

FUEL COST COMPARISON

Annual Fuel Costs:

Natural Gas - $12.1 million

Coal - $4.9 million

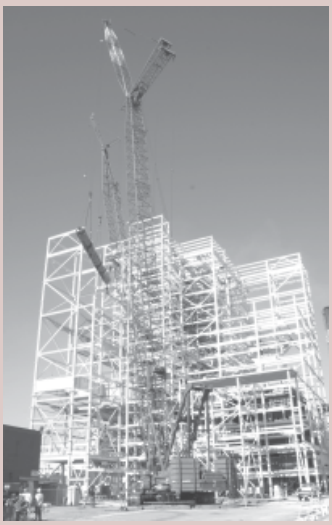
Wood-waste - $3.8 million

Assumptions:

Steam Load- 150,000 pph at 150 psig

Operating- 8,400 hours per year

Note: If you cogenerate and operate at 650 psig/750 ºF and use a backpressure STG, you generate approximately 5.7 MW. At a power cost of $55/MW, the net additional savings when firing coal is $1.8 million.



Permitted in downtown Chicago
1,100,000 PPH Coal-Fired Steam Facility
Corn Products International
ESI is performing the engineering, procurement, and construction management for this new coal-fired facility.

Permitted in downtown St. Paul
37 MW Wood-Fired Power Generation Facility
Trigen-Cinergy Solutions
ESI performed the engineering for this new wood-fired facility.

As ESI discussed in our Winter 2005 Issue of the *ENERGY SOURCE*, the current air emission control technologies required by the EPA makes permitting a coal installation relatively easy. Often, the project is not even a major source or major modification due to the very low potential emissions.

ESI began business in 1978 converting customers from natural gas to coal and have a portfolio of projects we have designed and built. Please visit the Project Case Studies Section of our web site, www. esitenn.com, to see some of these projects. If your company has been thinking “Natural Gas Prices Are Killing Us”, call Bill Reeves or Jay Garrett with ESI at 770-427-6200 to discuss the technical and economic viability of switching your facility to coal or wood-waste.

Natural Gas... *Continued from Page 2*

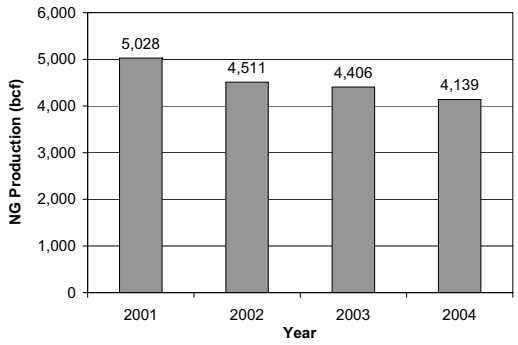


Figure 1. NG Production in Gulf of Mexico.

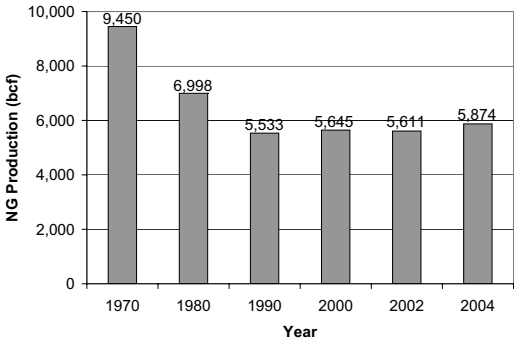


Figure 2. NG Production in Texas.

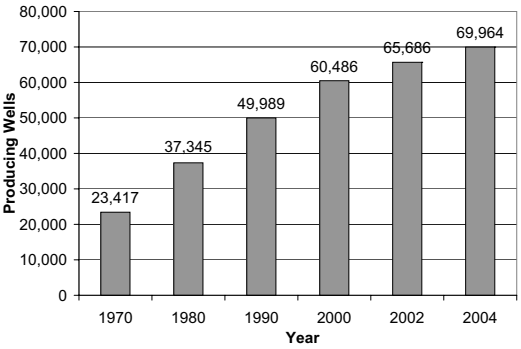


Figure 3. Number of NG Producing Wells in Texas.

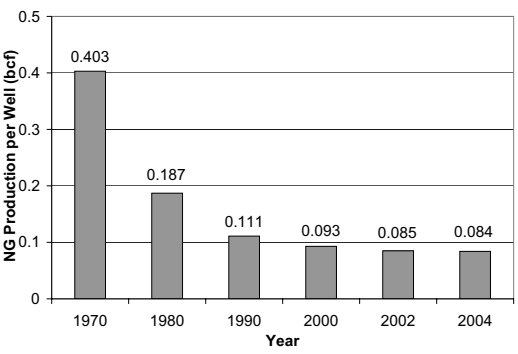


Figure 4. NG Production per Well in Texas.

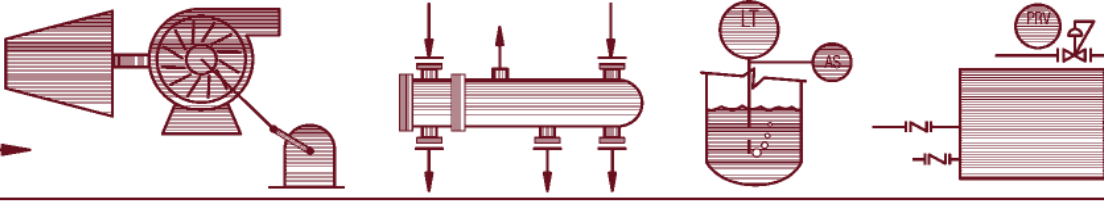
Emerging Shortfall of NG Supply

In 2004, the US consumed 22,424 bcf of NG which virtually all came from three sources: (1) domestic production (82%), (2) imports from Canada (15%), (3) imported LNG (3%). Unfortunately, there are significant and alarming problems with each of these sources which threaten to substantially curtail supply. The three biggest regions which produced 58% of the US NG supplies in 2004 were the Federal Gulf of Mexico (18%), Texas (24%), and Canada (16%).

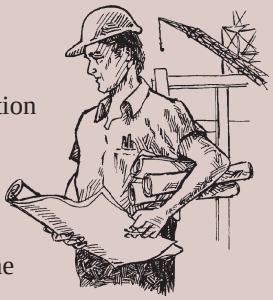
Despite the fact that the NG demand is forecasted to increase by 15% over the next 6 years, the Federal Gulf of Mexico has seen an average 6% year to year decline in production for the last 3 years which is illustrated in Figure 1. In Texas, it took three times as many wells in 2004 to produce 62% of the NG produced in Texas in 1970. This is shown in Figures 2, 3, and 4. In Canada, an increase of 6,939 wells (77%) from 2002 to 2004 was only able to keep production flat.

The shocking implications of this pattern are obvious. The supply of NG is drying up in the face of an ever-increasing demand. Natural gas prices in the future are not going to return to "normal" because normal is the sad reality of today's prices. As we head into winter, the consumer is going to experience first hand the severity of this problem. Companies that have a more long-range perspective and take action toward eliminating their dependence on NG are going to be the companies that survive and drive the market in the next decade. If you would like to discuss the economic viability of converting your energy production from natural gas, contact Jay Garrett or Bill Reeves with ESI.

E-mail: info@esitenn.com
Phone: 770-427-6200



DESIGN TIPS



When an industrial plant decides to make a modification or addition to their facility, a great deal of time is usually spent specifying the mechanical equipment and/or process performance that is expected. This is essential as these decisions are critical to plant operations and generally represent the largest costs associated with the new installation. However, some time spent on specifying the Architectural, Civil and Structural design criteria will make it easier to evaluate the bid proposals and will assure that the finished installation meets plant and local jurisdictional requirements. These steps will also limit cost and schedule impacts when the project is underway. A few areas that should be considered include:

- Applicable local design codes and any plant specific requirements. Although the International Building Code (IBC) has become the standard in most states, many municipalities have adopted amendments that should be clarified. Some plants also have loading requirements that are more stringent than those of IBC and these should be spelled out as well. Make sure that the plant design specifications reflect the most recently adopted codes.
- The painting requirements for structures, equipment, piping, etc. can have a significant impact on job costs. Paint specifications including manufacturer, surface preparation and coating requirements should be well defined for each project area.
- The building envelope for all new structures should be clearly identified. This would include the siding requirements (manufacturer, profile, gauge and color) and roofing system (standing seam, built-up, membrane, etc.) Warranties on roofing systems are available from the manufacturers at a cost and should be identified when required. Insulation requirements for walls and roofs should be specified as they impact both up-front and long-term costs to the plant.
- Foundation requirements can vary from simple, shallow spread footings to a variety of piling types. Specifying the foundation system to be assumed in the proposal, based on historical or recent soils data obtained from the project site, will assure an “apples to apples” comparison of the bids. Also, identifying any existing underground structures or utilities that will have to be removed or rerouted, will lessen the need for contract adders later in the project.
- Plant safety requirements, including training necessary for the subcontractors, will affect the project costs for all disciplines. Clarifying these requirements in the request for proposal documents will help assure compliance with the plant safety program.

DILBERT reprinted by permission of the United Feature Syndicated, Inc.