



## Highlights of a talk by Charles E. Bayless\* given April 14, 2005 at the WVU National Research Center for Coal and Energy

**Use of Natural gas (NG) for power generation has increased 25% since 1998 and is the main driver of the current NG price. During this same period, industrial NG use declined by 20%.**

- Many NG power generation units are shut down, but will come back on line if the price falls below \$4/MCF, thus creating a floor for price of NG.
- The U.S. has approximately 3% (200 TCF) of the world's NG reserves (5,300 TCF).
- At the current production rate, North American NG reserves would be depleted within 9.5 years. Saudi Arabia has approximately 60.6 yrs. remaining.
- The high price of NG is driving the U.S. petro-chemical industry off shore.

**Liquefied natural gas (LNG) is abundant and inexpensive in the Middle East and Africa.**

- Imported LNG will be a major factor in the price of NG.
- LNG is costly - \$1B for LNG terminal, another \$1B to liquefy it, plus shipping costs.

**Booming economies in the Third World will continue to put tremendous pressure on energy prices; however, they are better off paying the price no matter what it is. Current high energy prices are not a temporary price spike – they are likely to remain high.**

- The U.S. has 3% of the world's population, uses 29% of world's energy, but produces 26% of the world's gross domestic product (GDP).
- China's energy intensity, approximately 40,000 BTU/\$ of GDP, is rapidly approaching the U.S. energy intensity of approximately 15,000 BTU/\$ of GDP.
- Productivity measured in GDP per capita is approximately \$1/person in China and \$32/person in the U.S. Energy consumption in China is approximately 40,000 BTU/capita compared to 480,000 BTU/capita in the U.S.!
- Look at the European economy which has had \$5+ NG for many years to see how the U.S economy will evolve.

**OPEC production is near maximum. With new discoveries in Russia, Canada, and Africa, the Middle East will supply less of the world's oil on a percentage basis.**

- Saudi Arabia's 260 billion barrel (BBL) reserve is 24% of world's total; 60% of Saudi production comes from the Ghawar field - production at such a large field is not easily ramped up.

- North American reserves are 65.5 BBL, 6% of world's total.
- The Athabasca tar sands in Canada hold an estimated 330 BBL of recoverable oil.

**The U.S. has 25% of world's coal reserves - on a BTU basis, equivalent to the total world oil supply.**

- Coal costs an estimated \$1.50/ million BTU (MMBTU), oil \$10/ MMBTU, NG \$6/ MMBTU.
- Approximately 30,000 MW of new coal capacity have been "added" in past 10 years through increased utilization of existing plants, but this cannot continue into the future.
- Current coal plants are approximately 35% efficient; combined cycle turbines are an estimated 70% efficient; coal to gas conversion is roughly 40% efficient.
- Integrated gasification combined cycle (IGCC) plants are approximately 45% efficient, use less fuel, have very low SOx and NOx emissions, thrive on high-sulfur coal, and have synergies with the chemical industry.
- WV coal sells for approximately \$28 to \$30/ ton compared to Wyoming Powder River Basin coal that sells for \$6/ ton!

**There is huge potential to recover and recycle once-through energy. Many manufacturers throw away massive amounts of heat while at the same time using other fuels to create heat elsewhere.**

- Primary Energy LLC is a company that specializes in recycling waste heat and fuels from industrial processes; creates carbon credits.
- Distributed generation and co-generation have great potential to help meet energy demand and improve efficiencies.
- Nuclear power will come back.
- Global warming is here.
- Solar and wind are helped by higher prices, but require backup systems.

**WVU and WVU-IT can help the state and the nation by supporting IGCC!**

*\*Charles E. Bayless is the new President of West Virginia University Institute of Technology located in Montgomery, West Virginia. WVU-IT was recently honored by U.S. News and World Report in its annual "America's Best Colleges" publication. Mr. Bayless, a native West Virginian, has long been recognized as a leader in the nation's utility industry.*

### EVENTS

**2005 WV Manufacturers Association Annual Meeting will be held June 5-7, 2005.** For further information contact the WVMA at (304) 342-2123 or [wvma@wvma.com](mailto:wvma@wvma.com).

**Compressed Air Challenge Fundamentals Training Workshop sponsored by IOF-WV will be held June 16, 2005** at the Washington County Career Center in Marietta, Ohio. To register or learn more, please contact Nadine Kelly at (304) 293-2867 Ext. 5408 or [Nadine.Kelly@mail.wvu.edu](mailto:Nadine.Kelly@mail.wvu.edu).

**BTU's from the Forest: Educational Conference on the Use of Wood Fiber as an Energy Source will be held June 29-30, 2005** at the Radisson Hotel and Conference Center, Morgantown, WV. For further information visit <http://ahc.caf.wvu.edu/woodconf/> or contact Shawn Grushecky at (304) 293-2941 ext. 2413 or [sgrushec@wvu.edu](mailto:sgrushec@wvu.edu).

### IOF-WV Contacts

**Bill Johnson**  
WVUNRCCE  
(304) 293-2867 ext. 5530  
[William.Johnson@mail.wvu.edu](mailto:William.Johnson@mail.wvu.edu)

**Jeff Herholdt**  
WV Development Office  
(304) 558-2234  
[jherholdt@wvdo.org](mailto:jherholdt@wvdo.org)

**Kathleen Cullen**  
WVUNRCCE  
(304) 293-2867 ext. 5426  
[Kathleen.Cullen@mail.wvu.edu](mailto:Kathleen.Cullen@mail.wvu.edu)

**Carl Irwin**  
WVUNRCCE  
(304) 293-2867 ext. 5403  
[Carl.Irwin@mail.wvu.edu](mailto:Carl.Irwin@mail.wvu.edu)

**Nadine Kelly**  
WVUNRCCE  
(304) 293-2867 ext. 5408  
[Nadine.Kelly@mail.wvu.edu](mailto:Nadine.Kelly@mail.wvu.edu)

**Debi Conrad**  
WV Development Office  
(304) 558-2234  
[dconrad@wvdo.org](mailto:dconrad@wvdo.org)

**If you prefer to receive this newsletter electronically, please email Nadine Kelly**

## Co-Funding Opportunities for IOF-WV Research Teams

Announcement	Due Dates	Funding
<b>U.S. EPA SBIR/STTR</b> <a href="http://es.epa.gov/ncer/sbir/">http://es.epa.gov/ncer/sbir/</a>	Now Open (Request for Proposals) May 25, 2005 (Proposals Due)	\$100,000 for Phase I awards \$100,000 to \$750,000 for Phase II awards
<b>NSF Partnerships for Innovation</b> <a href="http://www.nsf.gov">www.nsf.gov</a>	Now Open (Request for Proposals) June 3, 2005 (Proposals due)	\$9 million in total funding
<b>U.S. DOE Fuel Cell Coal-Based Systems</b> <a href="http://e-center.doe.gov">http://e-center.doe.gov</a>	Now Open (Request for Proposals) June 7, 2005 (Proposals Due)	\$5 million in total funding for new Phase I awards
<b>NSF SBIR/STTR Phase I Solicitation FY-2006</b> <a href="http://www.nsf.gov">www.nsf.gov</a>	Now Open (Request for Proposals) June 8, 2005 (Proposals due)	\$100,000 for Phase I awards \$100,000 to \$750,000 for Phase II awards
<b>U.S. DOE Advanced Technologies and Concepts to Minimize Freshwater use in Coal-Based Thermoelectric Power Plants</b> <a href="http://e-center.doe.gov">http://e-center.doe.gov</a>	Now Open (Request for Proposals) June 10, 2005 (Proposals Due)	\$3 to \$4 million in total funding
<b>USDA Rural Development; Notice of Funds Availability for the Renewable Energy Systems and Energy Efficiency Improvements Grant Program</b> <a href="http://www.rurdev.usda.gov/rbs/farmbill/index.html">www.rurdev.usda.gov/rbs/farmbill/index.html</a>	Now Open (Request for Proposals) June 24, 2005 (Proposals Due)	\$11.4 million in total funding
<b>NSF Chemistry Research Instrumentation and Facilities: Departmental Multi-User Instrumentation</b> <a href="http://www.nsf.gov">www.nsf.gov</a>	Now Open (Request for Proposals) June 27, 2005 (Proposals Due)	Maximum of \$500,000 per request
<b>State Technologies Advancement Collaborative (STAC) Solicitation</b> <a href="http://www.stacenergy.org/solicitations/05-STAC-01/">http://www.stacenergy.org/solicitations/05-STAC-01/</a>	Now Open (Request for Proposals) July 15, 2005 (Proposals Due)	\$4.95 million in total funding for energy efficiency projects \$1.35 million in total funding for rebuild America projects
<b>U.S DOE - EERE - Forest Products</b> <a href="http://fedbizopps.gov">fedbizopps.gov</a>	Now Open (Request for Proposals) August 2, 2005 (Proposals Due)	\$2 million in total funding
<b>U.S. DOE EERE Materials for Energy Efficient Industrial Processing</b> <a href="http://www.eere.energy.gov/industry/financial/solicitations_future.html">http://www.eere.energy.gov/industry/financial/solicitations_future.html</a>	June 27, 2005 (Request for Proposals) TBD (Proposals Due)	TBD
<b>U.S. DOE EERE Chemicals Industry of the Future</b> <a href="http://www.eere.energy.gov/industry/financial/solicitations_future.html">http://www.eere.energy.gov/industry/financial/solicitations_future.html</a>	July 1, 2005 (Request for Proposals) TBD (Proposals Due)	TBD

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