The Future of Energy

What forces will shape the energy industry over the next ten years?

Michael J. Economides

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The Continuous Energy Crisis of the 21st Century

- ✓ Oil almost $150, then fell to below $40… headlines rule … "crisis"
  - ✓ OPEC has little excess capacity "behind the valve", Venezuela, Nigeria, Iraq
  - ✓ China still grows in economy and ener
- ✓ Oil over $100 (predicted for late 2010 - early 2011 in March 2010.) Middle East is the exclamation mark!

I will be $100, again

$100 OIL

$40 OIL

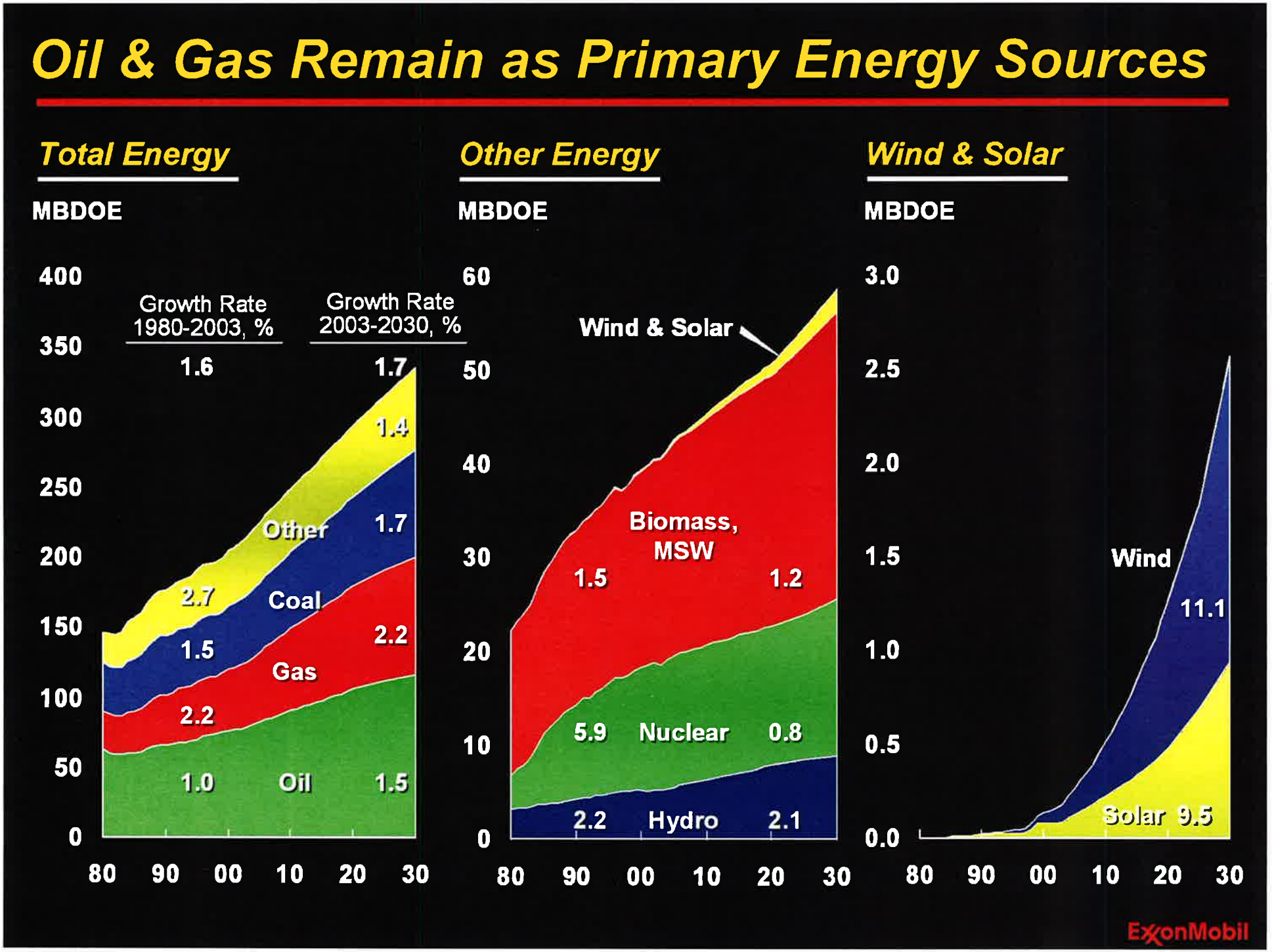
Natural Gas

- ✓ International demand destruction is larger than was anticipated
- ✓ Because of LNG developments in Qatar, Egypt and Sakhalin 2, there could be 10 Bcf/d excess supply. Considerable impact on gas prices in Europe and the United States – Cheniere LNG
- ✓ $5 gas for two to three years? Devastating impact on US shale gas

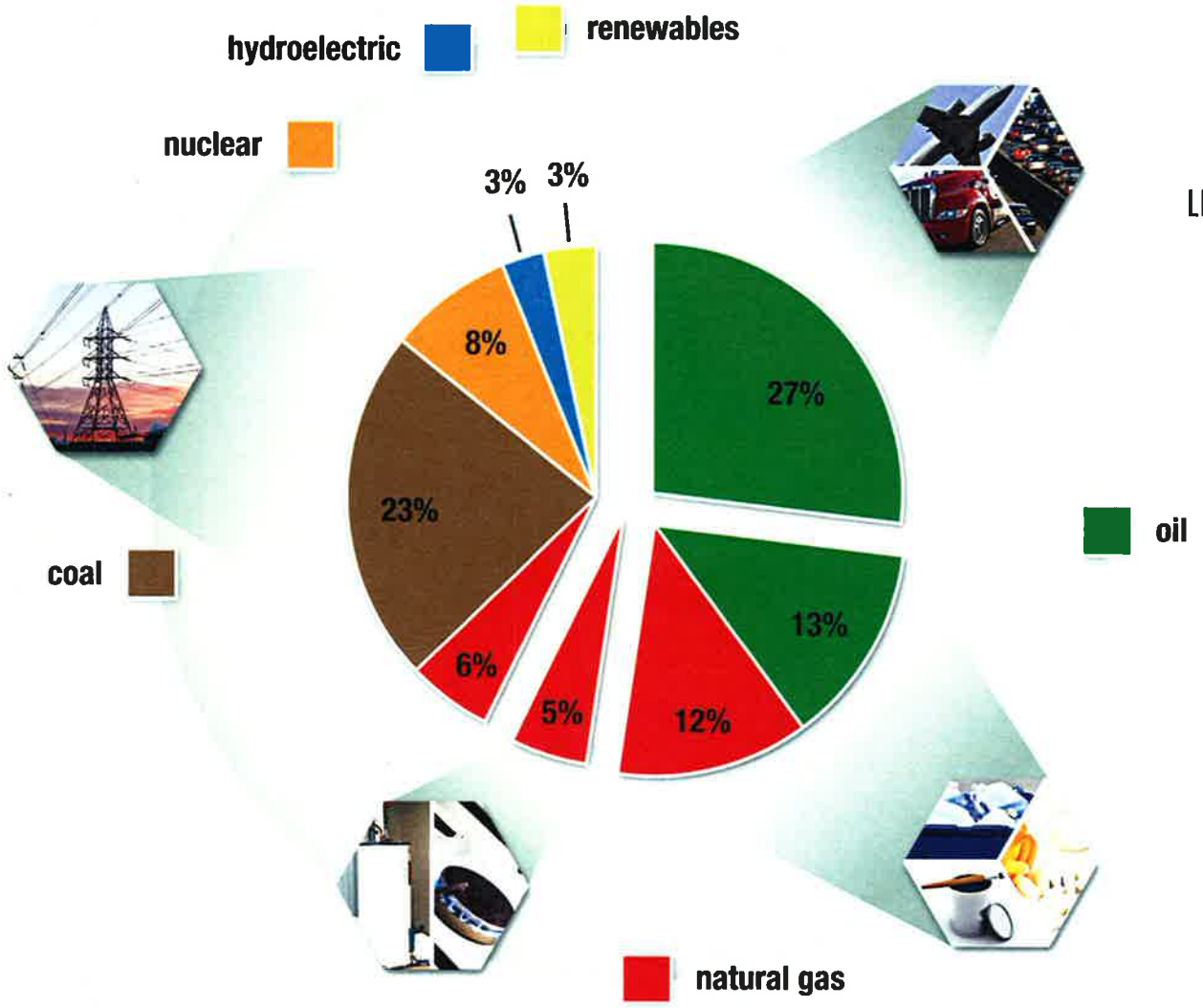
Future Oil and Gas Prices

- ✓ Major BTU disparity lasting decade(s)
- ✓ Because of technology challenges (and not just resource availability) and transportation robustness and homogeneity prices the world over will equalize
- ✓ $8 for natural gas in three years ad-infinitum, $100+ for oil

Oil & Gas Remain as Primary Energy Sources



US ENERGY SOURCES AND HOW THEY ARE USED



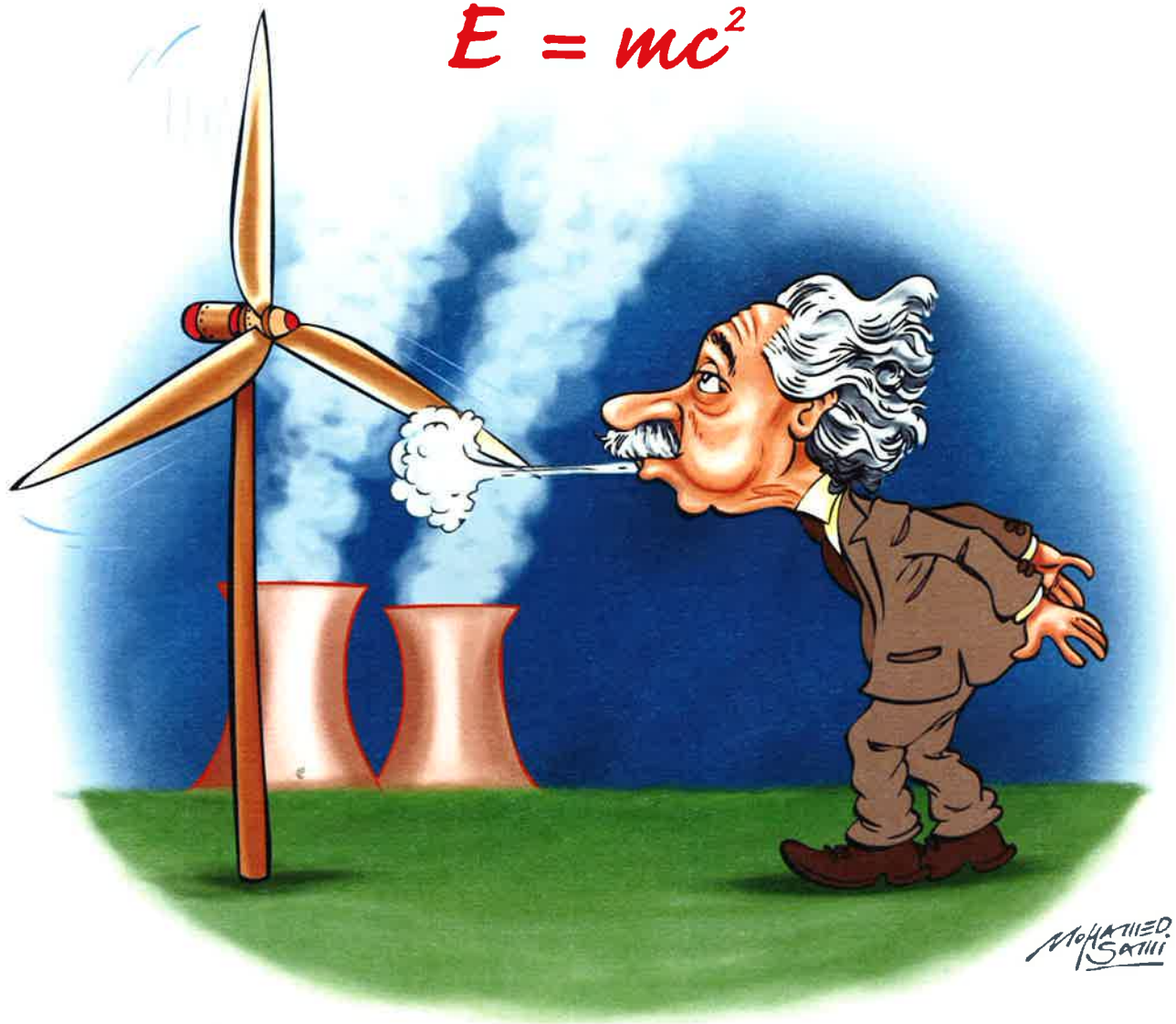
ELECTRIC POWER

PETROCHEMICAL PRODUCTS
- PLASTICS
- FIBERS
- SYNTHETIC MATERIALS
- PAINTS
- PHARMACEUTICALS
- FERTILIZER

LIQUID TRANSPORATION FUELS
- JET FUEL
- DIESEL
- GASOLINE

HEATING

$E = mc^2$



This just doesn't make it

MOHAMED SAMI

The New Energy Economy

- Wood (1800s)
- Coal
- Oil
- Natural Gas
- Hydrogen (envisioned)

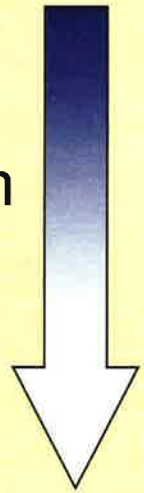
Carbon content:

High

Medium

Low

(Zero)



Increasingly:

- Clean
- Energy intensive
- Technologically sophisticated
- Distributed

Energy

Renewable hydrogen may be 'grown'

Bloomberg News

LONDON — A clean, low-cost and renewable source of energy may be generated by making hydrogen fuel from plant material, a study in last week's edition of the journal Nature says.

The process converts sugar from plant materials like corn into hydrogen that could power energy-intensive consumer needs, according to study author Jim Dumesic, a chemical engineer at the University of Wisconsin at Madison.

Hydrogen is a power source for fuel cells, batterylike devices that convert hydrogen and oxygen directly into electrical energy with little or no waste. Hydrogen production is energy intensive, making fuel cells expensive to operate, Dumesic said.

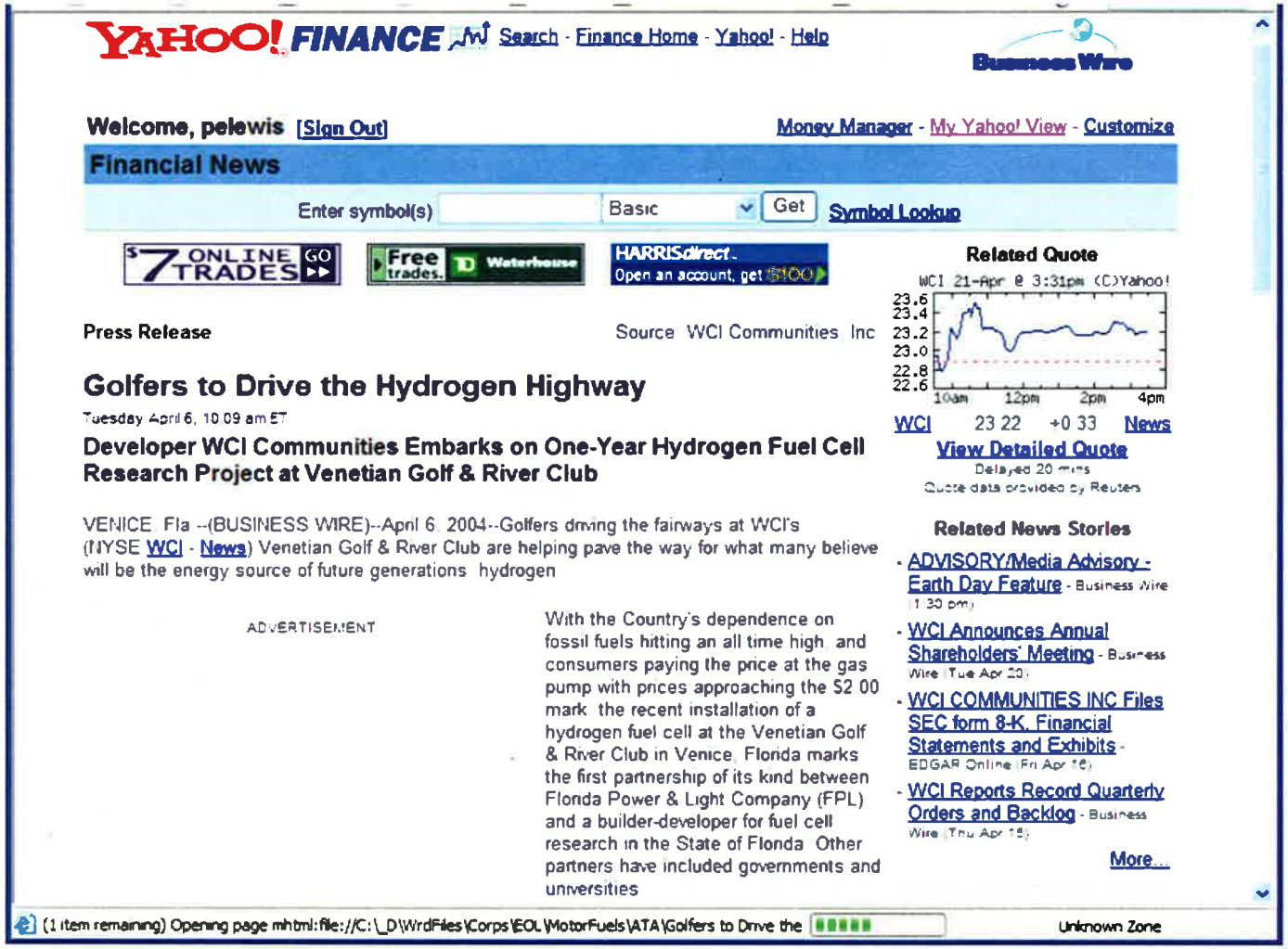
"Right now, most of the hydrogen from fuel cells comes from petroleum," he said. "We're looking at making hydrogen from renewable resources, like corn stalks."

If it works, it would be possible to get large amounts of a clean, energy-rich fuel from waste plant products, such as tons of leftover sugar cane, weeds and wood, and even from such animal byproducts as cheese whey.

Dumesic and his colleagues have devised a way of getting hydrogen from vegetable matter by heating it to about 437 degrees, about 720 degrees lower than current methods of hydrogen production. The process produces only small amounts of carbon monoxide, which degrades fuel cells Dumesic said.

A number of automakers have built or are planning prototypes powered by fuel cells.

Golfing for Hydrogen



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Press Release

Source: WCI Communities, Inc.

Golfers to Drive the Hydrogen Highway

Tuesday April 6, 10:09 am ET

Developer WCI Communities Embarks on One-Year Hydrogen Fuel Cell Research Project at Venetian Golf & River Club

VENICE, Fla.--(BUSINESS WIRE)--April 6, 2004--Golfers driving the fairways at WCI's (NYSE: WCI - News) Venetian Golf & River Club are helping pave the way for what many believe will be the energy source of future generations: hydrogen.

ADVERTISEMENT

With the Country's dependence on fossil fuels hitting an all time high, and consumers paying the price at the gas pump with prices approaching the $2.00 mark, the recent installation of a hydrogen fuel cell at the Venetian Golf & River Club in Venice, Florida marks the first partnership of its kind between Florida Power & Light Company (FPL) and a builder-developer for fuel cell research in the State of Florida. Other partners have included governments and universities

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WCI 23.22 +0.33 News

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- WCI Announces Annual Shareholders' Meeting - Business Wire (Tue Apr 20)
- WCI COMMUNITIES INC Files SEC form 8-K, Financial Statements and Exhibits - EDGAR Online (Fri Apr 16)
- WCI Reports Record Quarterly Orders and Backlog - Business Wire (Thu Apr 15)

More...

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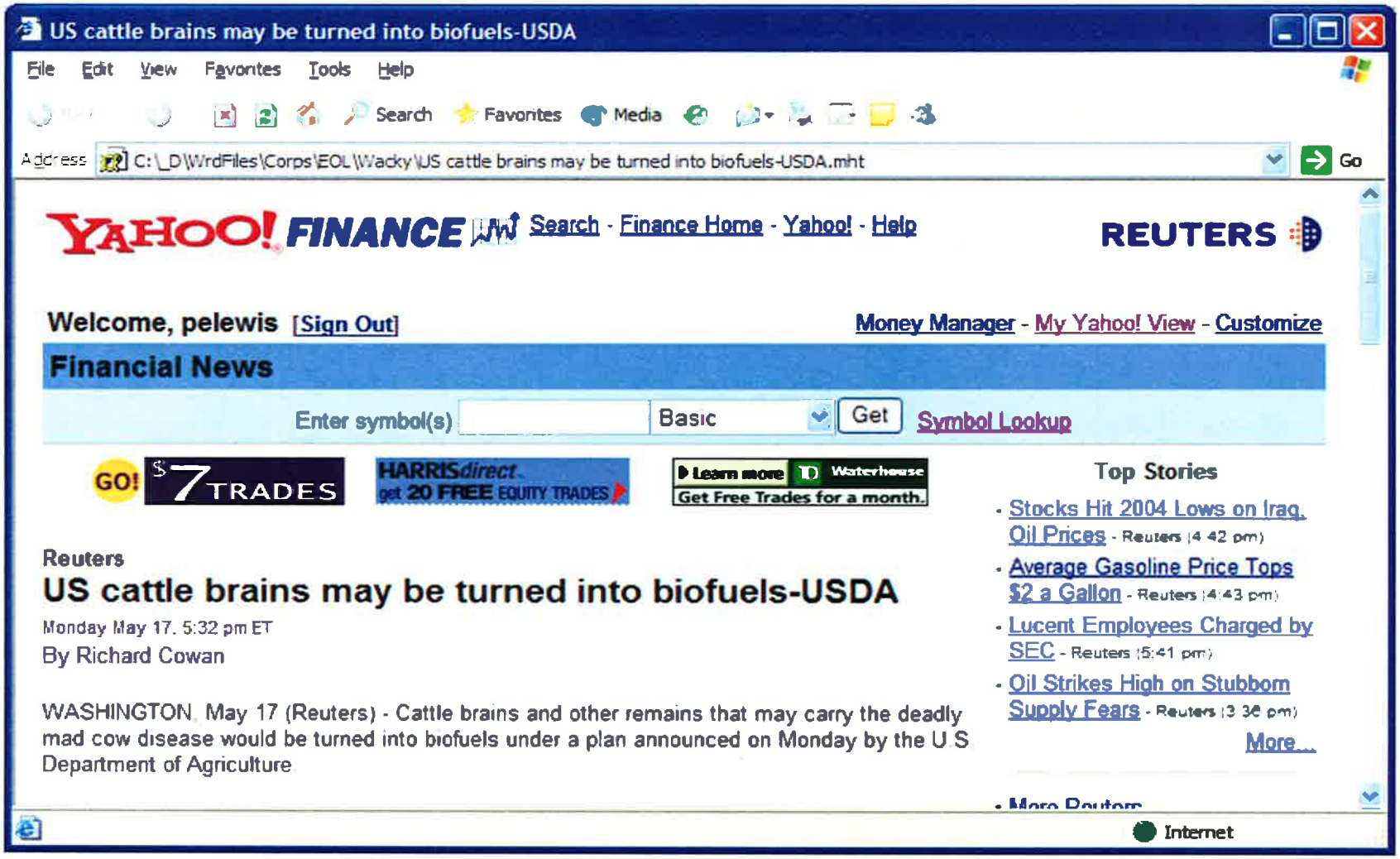
Unknown Zone

Bovine Brain Power > Mad Car Disease?



www.energytribune.com

April 2006

Energy Tribune

Leading the debate. Beating the street.

The ETHANOL SCAM pg. 11

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Joe Klein: How Al Gore Could Save The Democrats

Hillary Clinton On Why She Won't Quit

R.E.M. Rises from The Dead

TIME

The Clean Energy Myth

BY MICHAEL GRUNWALD

Politicians and Big Business are pushing biofuels like corn-based ethanol as alternatives to oil. All they're really doing is driving up food prices and making global warming worse—and you're paying for it

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HOUSTON TX 77024-6405

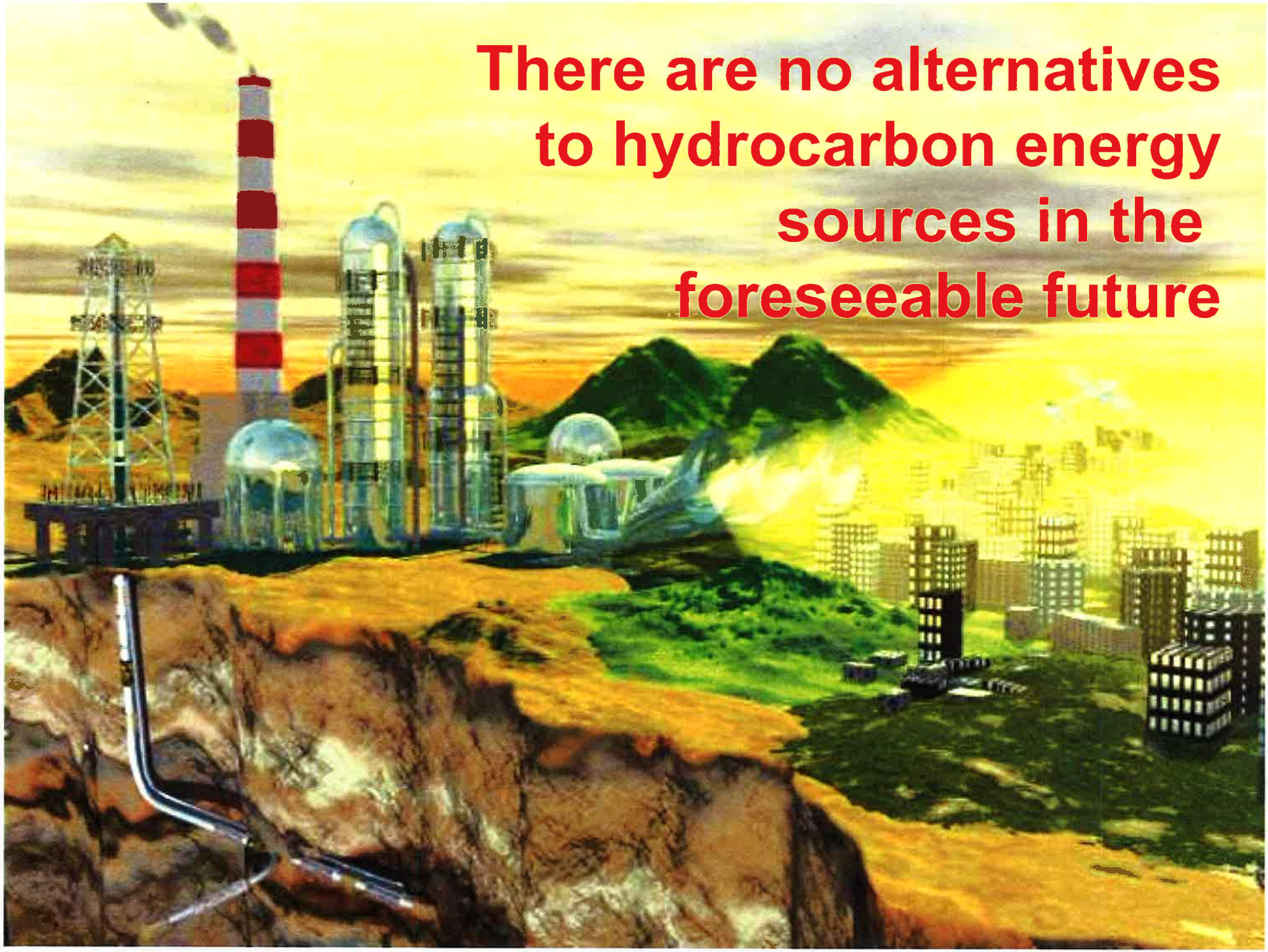
The Ethanol Scam

Ethanol from Coal or Gas

- ✓ Celanese Corp. announced on Nov. 10, 2010 an "innovative technology to extract ethanol from hydrocarbon feedstocks" such as coal, natural gas and pet coke
- ✓ This should kill corn based ethanol. It is both logical and necessary
- ✓ American ingenuity at its best

Wind Power Exposed: Expensive, Unreliable and Won't Save Natural Gas

UK Ofgem: wind "grossly distorting the market"
29.7% of cost for 1.3% of electric supply
Load factor: 27.4%. Gas demand goes up


There are no alternatives
to hydrocarbon energy
sources in the
foreseeable future

Outlook

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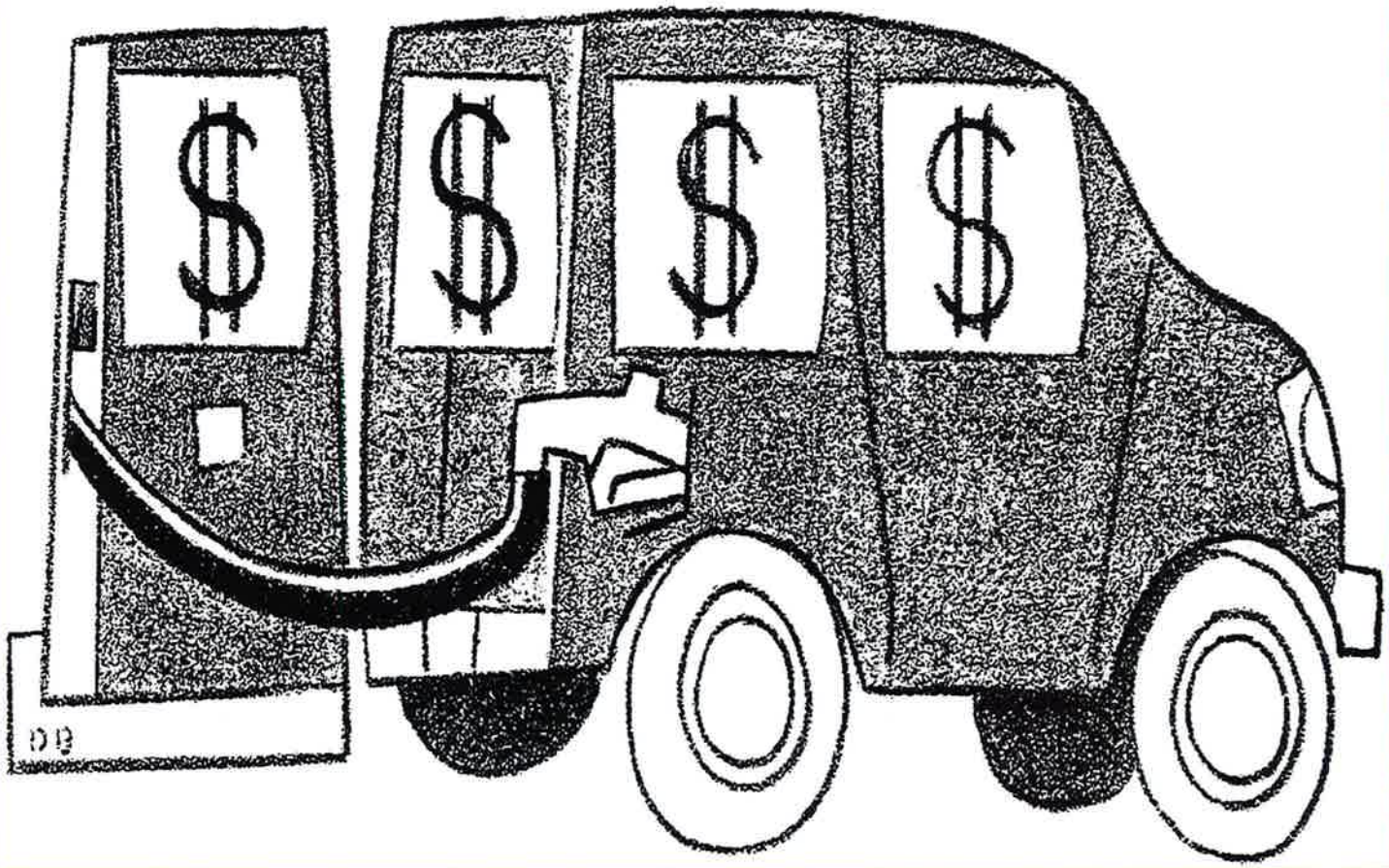


Keep driving those SUVs — the oil will be there

By MICHAEL J. ECONOMIDES and RONALD E. OLIGNEY

THE Organization of Petroleum Exporting Countires has announced a 700,000-barrels-per-day increase in production. This amounts to little more

Economides and Oligney are professors at the University of Houston, advisers to Fortune 500 companies, and authors of *The Color Of Oil: The History, the Money and the Politics of the World's Biggest Business*.

they play.

Third, the primary OPEC commodity is

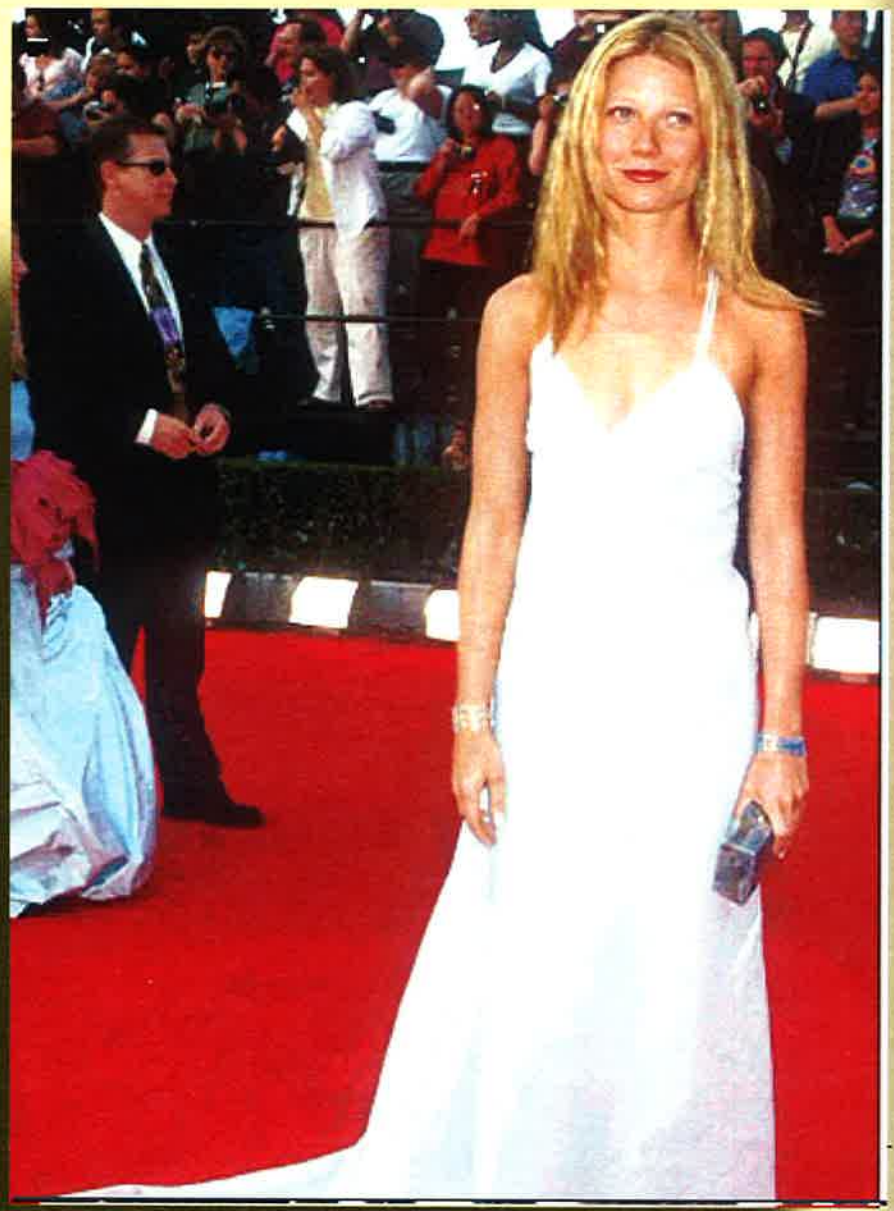
press, Daimler Chrysler and Dell all have this in common.

In the energy business, arguably the most essential element of the emerging modern world, new-economy companies include the newly merged El Paso, Enron, Burlington Resources, Schlumberger and the revamped Halliburton.

These companies understand the power

Gwyneth Paltrow

Energy Expert



Energy

AUGUST 26, 2002
www.time.com AOL Keyword: TIME
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HOW TO SAVE THE EARTH
The hot and wild weather is a sign of things to come. But fresh ideas and new technology can cool us down and make this a GREEN CENTURY
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Christopher
r of "design
" at GM.

◀HOP ON!
The Segway runs on 5¢ of electricity a day. Just lean forward, and it accelerates

Americans' appetite for fast, powerful cars and roomy sport-utility vehicles (SUVs) makes it unlikely that they will ever settle for a two-seater the size of a golf cart that takes 17 sec. to go from zero to 60 m.p.h. (about twice as long as the typical car sold in the U.S.). Hence Detroit's preoccupation with fuel cells, which could ultimately clean up even the most monstrous SUV.

Making personal transport less damaging to the planet means looking beyond cars as well. "If you could wave a magic wand and make

Robotic Lawn Mower Here's how being eco-friendly can make your weekend easier. While two-stroke weed whackers are horrible for the planet (releasing a billion tons of hydrocarbons into the atmosphere each year), the robomower runs on a rechargeable battery—and it does your lawn for you. Just put down a perimeter wire so it knows where to go, sit back and enjoy the silence. [*www.friendly machines.com*]

The reaction to it
Evidence of man-made global warming

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Energy Tribune
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Carbon Sequestration:
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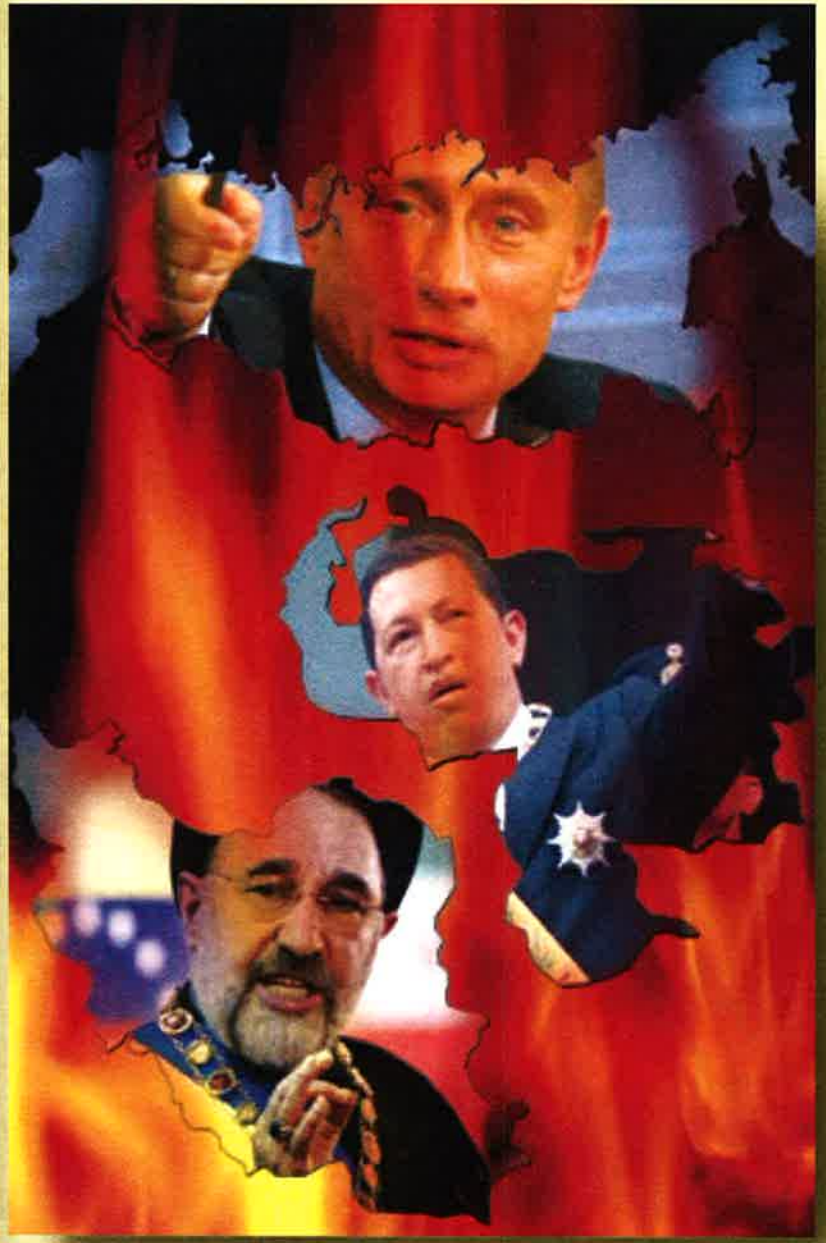
ENERGY AND CLIMATE WARS

How Naive Politicians, Green Ideologues, and Media Elites are Undermining the Truth About Energy and Climate

Peter C. Glover *and* Michael J. Economides



Energy Geopolitics

The Axis of Energy Militants

- Iran
- Venezuela
- Russia under Putin

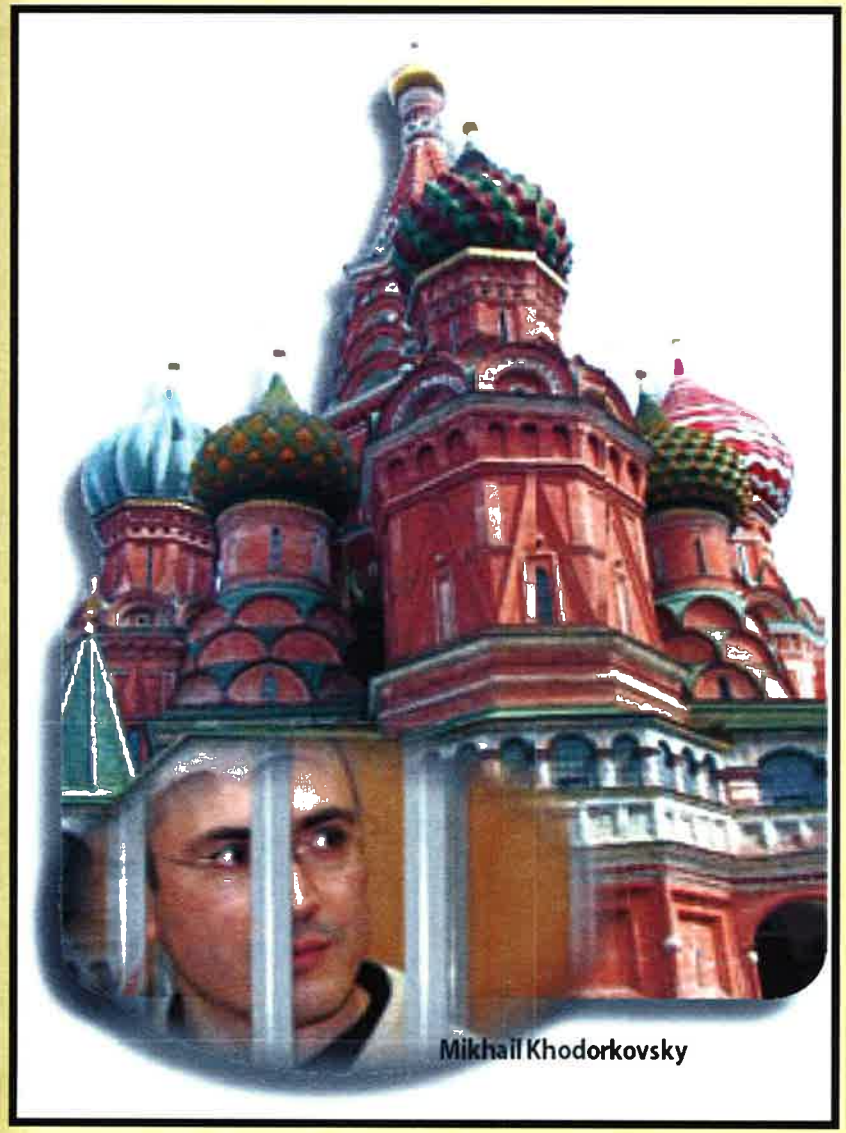
- The quagmire that is Iraq

- China

OIL
PRICES
MOHAMED SAMI

MOHAMED SAMI

Russia under Putin



- Bright spot in oil is gone
- Re-Sovietization
- Corruption
- Total control of press
- Investment climate has cooled down
- Production is bound to decline

RUSSIA

Messy Road to Energy Dominance

By Michael J. Economides and Ronald E. Oligney

MOSCOW — As Americans worry about Middle East oil supplies, a much bigger energy drama is playing out in Russia. That country now produces about as much oil as Saudi Arabia, exports about 4 million barrels a day and is unabashedly moving toward increasing production. When this is considered alongside Russia's probable dominance in the natural gas market over the coming decades, it becomes apparent that the most radical energy realignment in the world since the creation of OPEC and the 1973 Arab oil embargo is underway.

But the road to energy dominance is not proving an easy one. Late last month, the government of President Vladimir V. Putin arrested oil magnate Mikhail Khodorkovsky on charges of fraud and tax evasion. Last week, the government impounded his shares — some 44% of the total — in the country's largest oil company, Yukos.

With a net worth estimated at $8 billion and labeled by some as "Russia's Bill Gates," Khodorkovsky was allowed during the Boris Yeltsin era to purchase Yukos for a relatively small sum in a controversial 1996 privatization deal. In recent months, ExxonMobil and ChevronTexaco have been among the U.S. oil companies bidding furiously to acquire a piece of Yukos.

Speculation is rampant about the government's motivation in arresting Khodorkovsky. The Yukos chief had made his interest in reforming Russia's political structure apparent. He donated large sums to opposition parties, and he has been mentioned as a possible presidential candidate. One theory is that it was these political actions that prompted his arrest. Others speculate that the move is part of a government bid to renationalize the energy industry.

Whatever the reason, the Khodorkovsky arrest complicates Russia's energy future. The country's ascendancy in the energy world has been an important counterbalance to the power of the Organization of Petroleum Exporting Countries. Many in the West hoped it would also point the way to a new-style Russian economy and society.

Two decades ago, the Soviet Union's overreliance on oil revenues for foreign currency contributed to its demise. The oil price collapse of the mid-1980s, following deliberate overproduction by Saudi Arabia, caused many internal fractures in the Soviet regime to become gaping holes, in part because of the country's almost exclusive dependence on oil revenues for hard currency. Some have worried that, in the wake of a collapse in the industrial sector after the fall of communism, Russia is now more dependent than ever on oil. But oil is only half of the story. The bigger Russian future is natural gas.

Gradually, over the last 15 years, the world — led by the United States — has moved toward making natural gas its fuel of choice. This is proving to be a revolutionary, though technologically disruptive, transition. But the benefits will prove considerable. Natural gas is a far more efficient and cleaner fuel that lends itself to the miniaturization of the engines it powers. It has a large role to play as we attempt to wean ourselves from carbon fuels.

There are many signs of this shift, the most obvious being that nearly all of the power plants planned or under construction in the United States will run on natural gas. There is little chance that renewable energy like wind and solar power will play a significant role for decades, and perhaps not even then. Consequently, the United States will soon become a massive importer of natural gas in the form of liquefied natural gas.

With by far the world's largest reserves, perhaps as much as 40% of the recoverable natural gas on the planet, Russia will be in the driver's seat for generations to come. China, conveniently on Russia's border, has increased its energy demand by an astonishing 110% in the last decade, and its needs continue to rise.

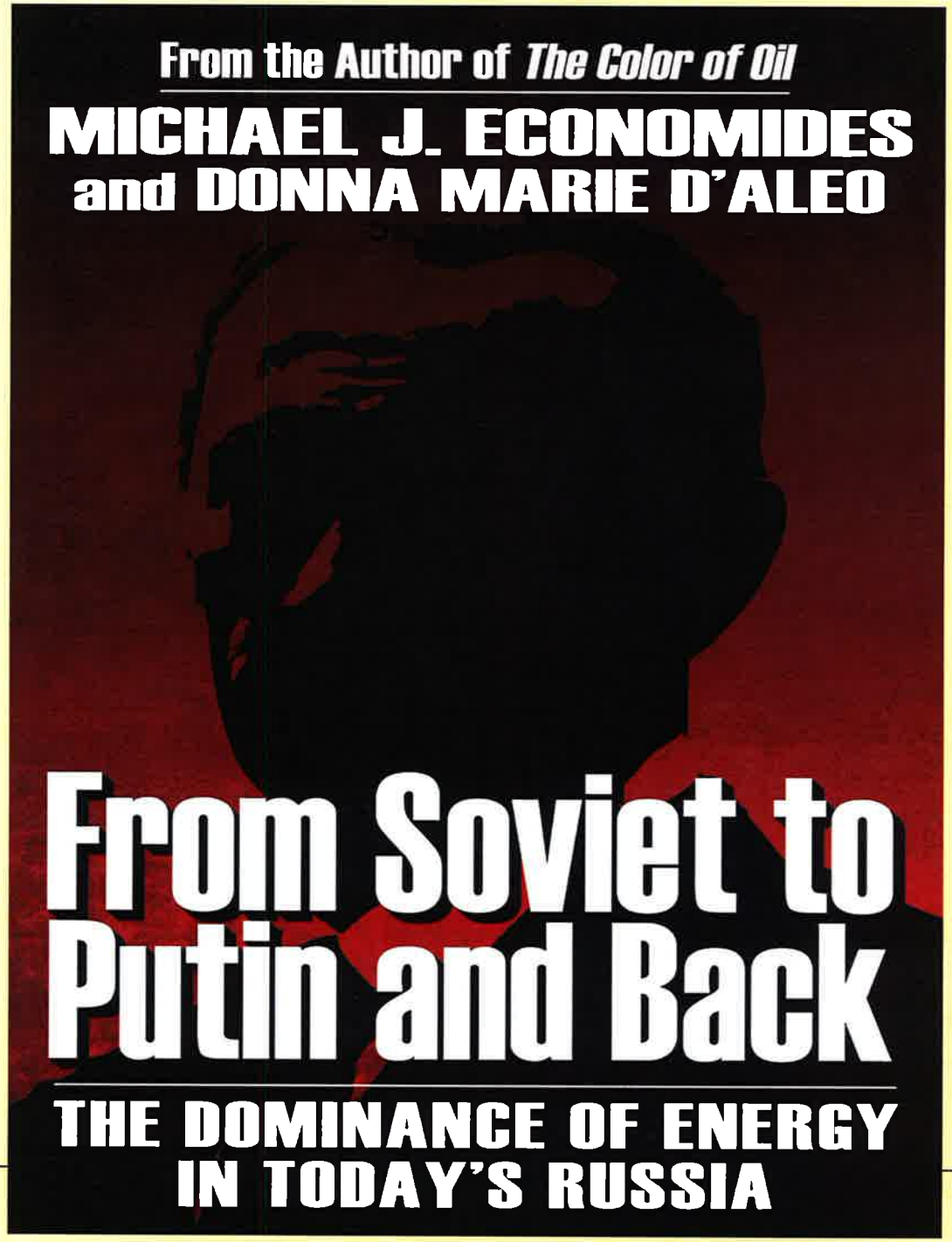
All of this adds up to one thing: Russia's dominance in energy. That is why the world will be watching closely as Putin moves forward — both with his prosecution of Khodorkovsky and with his country's move to exploit its considerable energy reserves.

Christopher Wormell For The Times

Michael J. Economides is a professor at the University of Houston and is chief technology officer of the Texas Energy Center. Ronald E. Oligney is director of the center. They are co-authors of "The Color of Oil: The History, the Money and the Politics of the World's Biggest Business."

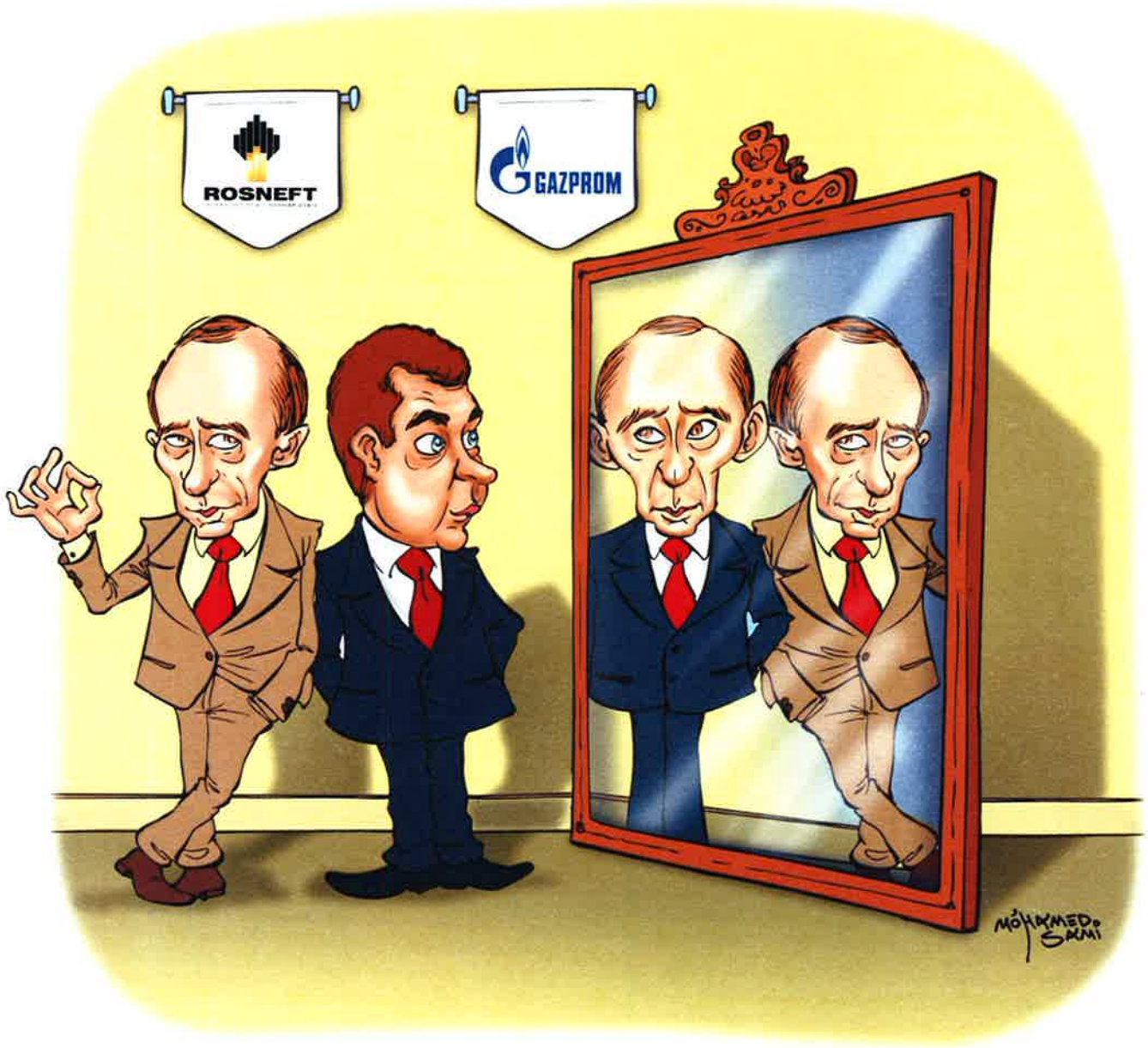
From the Author of *The Color of Oil*

MICHAEL J. ECONOMIDES and DONNA MARIE D'ALEO



From Soviet to Putin and Back

THE DOMINANCE OF ENERGY IN TODAY'S RUSSIA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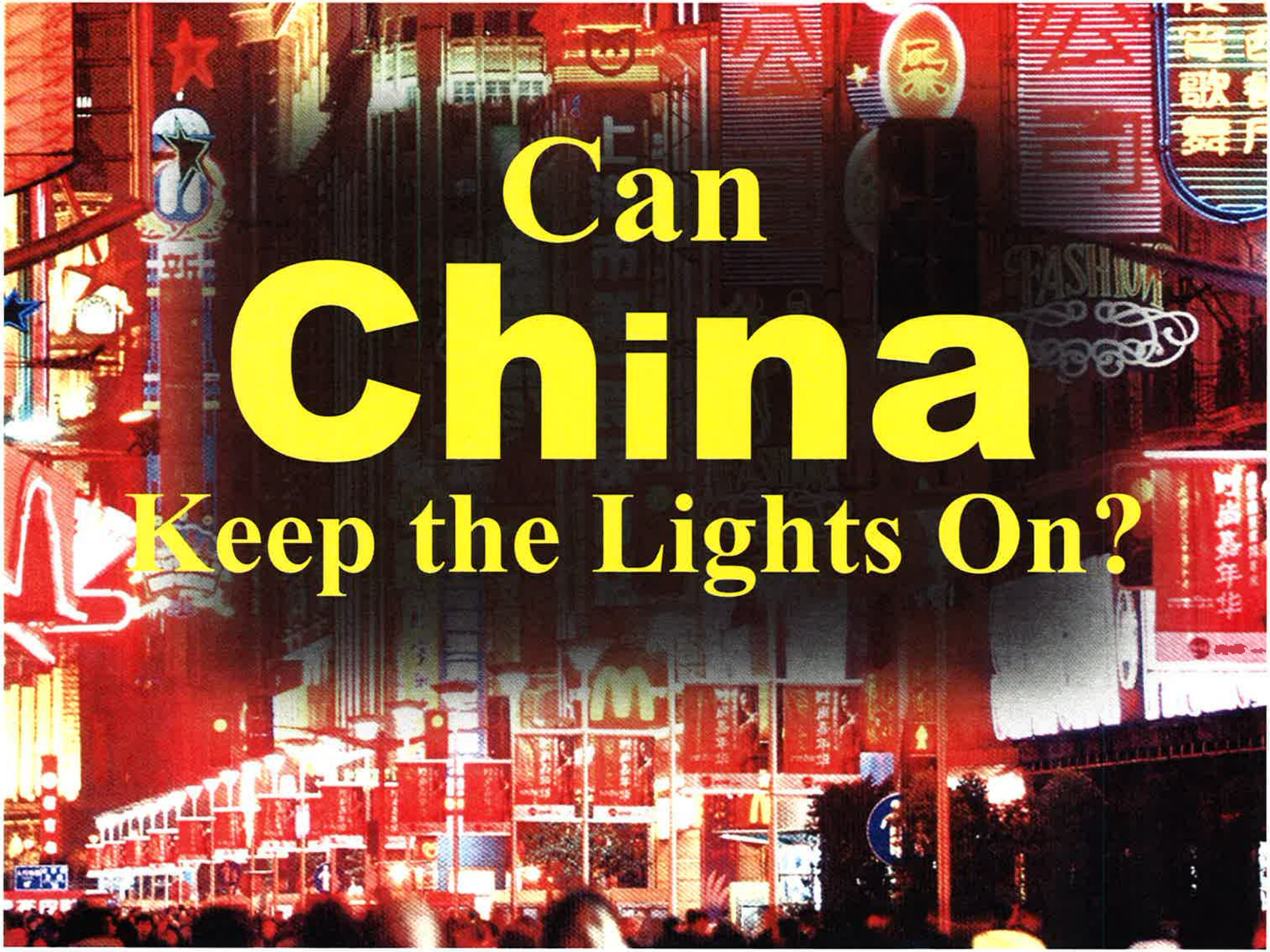
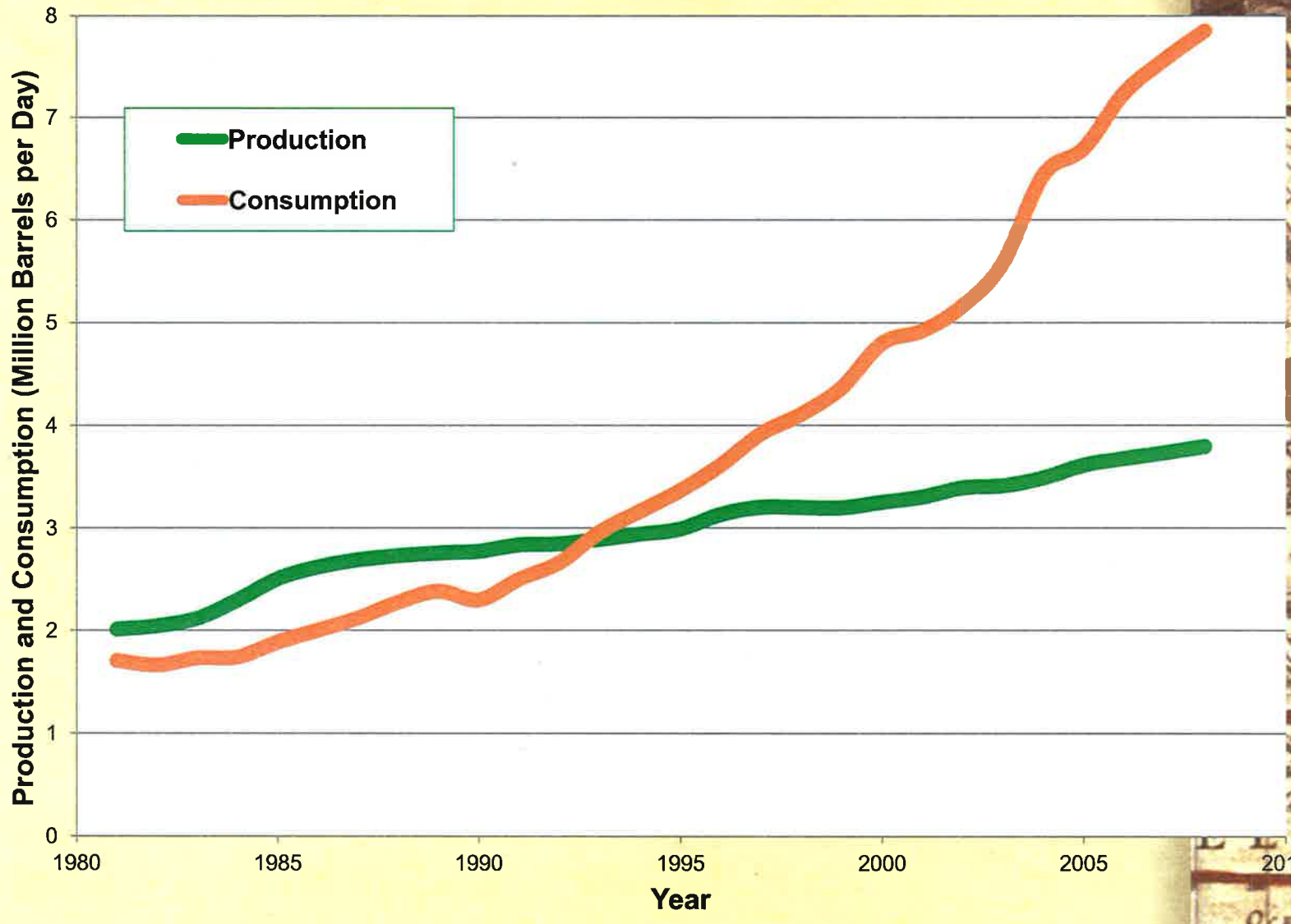
There Goes Libyan Oil

By Andrés Cala

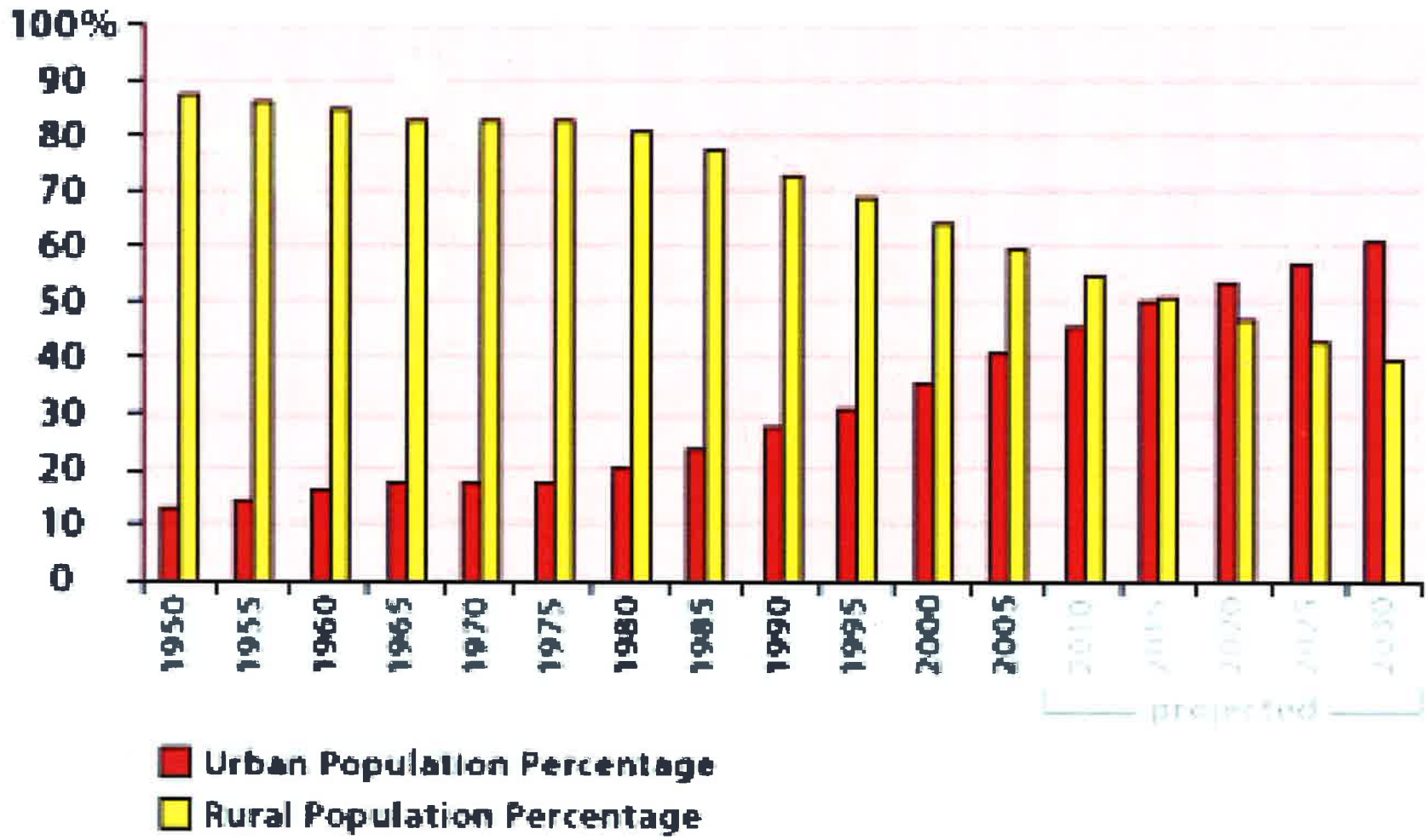

Can
China
Keep the Lights On?

Energy: China's Choke Point

China's Oil Production and Consumption



CHINA URBAN/RURAL POPULATION GROWTH 1950-2030



From Stratfor, 2009

China Seeking Energy

- Energy will be China's choke point
- Has become recently very assertive, if not belligerent.
  - Sudan, Nigeria
  - Canada
  - Argentina, Venezuela
- China's energy future passes through Russia….

CNPC – 40% in Junin 4 block of Orinoco (400,000 bpd).

Sinopec – 40% in Junin 1 and 8 blocks (each 200,000 bpd).

Sinopec – To build a refinery with 200,000 bpd capacity to process heavy crude in Venezuela.

Sinopec – $2.5 billion to Occidental for its Argentina assets.

CNOOC – 50% of Argentina's Bridas for $3.1 billion. Next Bridas pays $7.1 billion to BP for 60% of Pan American Energy.

Sinopec – 40% of Repsol's Brazil operations for $7.1 billion.

Sinochem – 40% of Statoil's Peregrino subsalt field for $3.1 billion.

China's Latin America (2010) $60 billion

Russia and China

China will probably lead