

INSIDE:

- Lessons From the Past 2
- The Past Is Not the Future 2
- Keep on Driving 3
- Alternative Fuels: A Longer-Dated Story 4

Goldman Sachs International
 Peterborough Court
 133 Fleet Street
 London EC4A 2BB
 England

Jim O'Neill
 jim.oneill@gs.com
 +44 (0)20 7774 2699

Sandra Lawson
 sandra.lawson@gs.com
 +1 212 902 6821

Roopa Purushothaman
 roopa.purushothaman@gs.com
 +1 212 902 5804

www.gs.com/ceoconfidential

A World Beyond Oil

High oil prices do not make for an 'oil shock,' given that the oil intensity of GDP has fallen significantly, to just half or less of its level of the early 1970s in the developed economies. We discuss the shift away from reliance on oil and the prospect for alternative fuels in coming years.

Oil prices remain remarkably high, with WTI again trading above \$50/bbl. With global demand growth likely to outpace supply growth over the next 18 months, there is little relief in sight.

Does this mean that the world economy is experiencing the sort of 'oil shock' that roiled the globe in the 1970s? Is there scope for the world to significantly reduce its reliance on oil in the years ahead? Can 'alternative' fuels move center stage?

Our answers are no, no and yes—but only in the medium-term. Today's high prices do not rise to the level of the 'shocks' experienced in the 1970s. The world's vulnerability to oil prices has declined dramatically in the intervening decades. Oil intensity of GDP—the amount of oil required to produce one dollar of GDP—has fallen significantly. Gains are most notable in the developed economies, where oil intensity of GDP is just half or less of its level of the early 1970s.

Even in the developing world, oil intensity has fallen, though less dramatically. The factors behind the shift—more efficient manufacturing processes, the shuttering of uncompetitive industries, and the shift away from manufacturing toward services—have been global phenomena. In China, oil intensity has fallen significantly, by nearly 30% since 1970, despite rapid industrialization. In Russia, oil intensity today is just 65% of its peak in the late 1980s, before the collapse of the Soviet Union.

While there is some scope for further adjustment in developing countries, particularly for a greater shift to services, the world

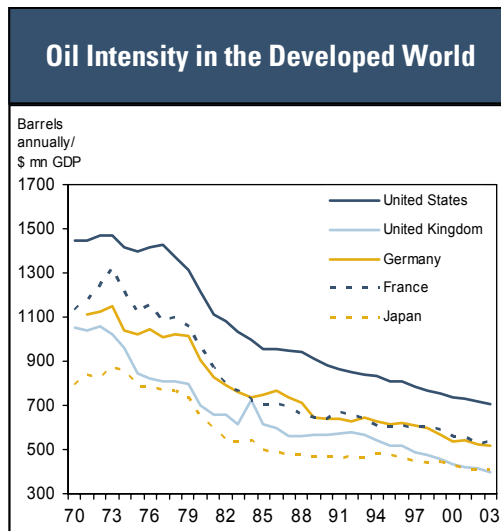
economy is unlikely to see a transformation on the scale of what occurred in the 1970s and 1980s. Moreover, transport accounts for over 50% of global oil consumption, and there are no widely available alternatives to oil.

Natural gas could overtake oil consumption as soon as 2020. But renewable fuels such as solar, hydro and wind power are a story of the more distant future, given the economic challenges of scaling up production and building the infrastructure for storage, transport and distribution.

Oil Prices Set to Stay High

On the expectation that oil demand growth will outpace supply growth over the next 18 months, we now forecast WTI at \$53.50/bbl, up from \$49/bbl, for the rest of 2005, and at \$55/bbl in 2006. Two decades of underinvestment in production and refining

continued on page 2



A World Beyond Oil

continued from page 1

have increased the costs of finding and developing reserves, and the effective taxation on oil output has soared, lending strength to long-dated prices. Our view is shared by the market, which sees longer-dated oil prices as \$25/bbl higher than at the start of the decade.

Lessons From the Past

The world is less vulnerable now largely because of the impact of the 1970s oil shocks, which did jolt the world into slashing its dependence on oil. Global oil consumption, which had been growing at 7.5% annually in the late 1960s and early 1970s, fell for two years following the first oil shock in 1973. It recovered somewhat over the remainder of the decade, but the second shock in 1979 triggered a sharp decline.

Global oil consumption did not recover its 1979 peak for a decade. The oil shock was most acute—and the adjustment most dramatic—in the developed world. Oil consumption in the OECD did not recover its 1979 peak for a full 15 years; even now it is just 10% higher than in 1979. Japan did not regain its 1979 peak until 1992, and the US not until 1998. In the EU-15, total oil consumption is

still 5% lower than in 1979. Since 1990, despite average annual global GDP growth of 3.6%, annual oil consumption has risen by just 1.6%.

While part of the decline in oil consumption reflects a switch to alternative fuels, notably natural gas in Europe and nuclear power in Japan, the bigger story is that the world economy has become much less energy-dependent. This occurred in three ways.

- High oil prices prompted a shakeout in manufacturing. Sectors of the ‘old’ industrial economies that had the highest price elasticities went into a structural decline. Some shut down; others adopted more efficient production processes or shifted toward alternative fuels, particularly natural gas.
- Domestic consumption patterns shifted, as governments began to promote public transport and took steps to conserve oil in transport and heating.
- Most importantly over the long run, the oil shocks accelerated the shift away from energy-intensive manufacturing and toward services. In the early 1970s, services accounted for 50%-60% of GDP in most G7 countries. As manufacturing has declined and knowledge-intensive industries have flourished, the share of services has risen across the board. Services now account for 70% or more of GDP in the G7.

As a result, global reliance on oil has fallen dramatically. Oil intensity, measured as the number of barrels required to produce each dollar of GDP, is now half of its 1970 level in the US, Japan and Canada. It has fallen further in Western Europe, with

most countries showing declines of 50%-60%.

This decline had already begun in the developed economies by the early 1970s, but the oil shocks accelerated the process. The biggest shift occurred in the 1980s, when oil intensity of GDP fell by 4% per year in the US, Japan and Canada and by 3%-7% in Western Europe. The pace of decline slowed in the 1990s, when oil prices in real terms averaged only half their levels of the 1980s.

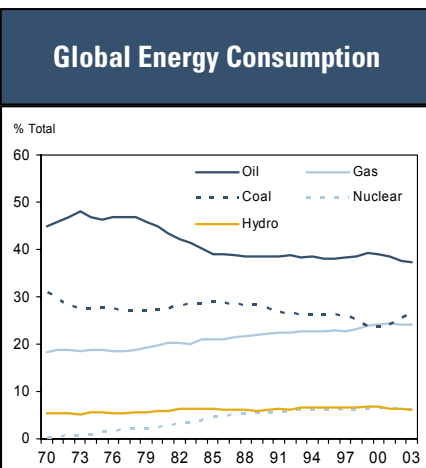
Oil intensity has continued to fall throughout the developed economies, with the annual decline over the past 15 years averaging nearly 2% in the US, 1% in Japan and 1%-2% in Western Europe. The growth of services and trend toward offshoring manufacturing should mean that this decline in the OECD is maintained over coming years.

The Past Is Not the Future

The success of the developed world in slashing its reliance on oil over the past three decades might suggest a similar path forward for developing economies. If so, then the prospect of high oil prices sustained over the next few years should be less daunting for the world economy.

The initial impact of the 1970s oil shocks was in fact less dramatic in the developing world than in the OECD. In non-Japan Asia, growth in annual consumption slowed, but non-Japan Asia today uses three times as much oil as in 1979. In China, consumption fell by roughly 10% in the early 1980s; since then, apart from a brief slowdown in the early 1990s, it has grown at 7% per year. In much of Latin America, consumption also dipped in the early 1980s, but the

continued on page 3



A World Beyond Oil

continued from page 2

peak-to-trough fall was milder than in the US and the EU.

Oil consumption, not surprisingly, continues to grow faster in the emerging world than in developed countries. Rapid economic growth in the BRICs economies—Brazil, Russia, India and China—will maintain pressure on oil demand for at least the next decade.

But although developing countries may be using more oil, they too have made significant progress in reducing the oil intensity of their economies.

The shift toward more oil-efficient industrial processes has been a worldwide phenomenon. So too has the shift toward services, though this process still has scope to run in the developing world. Geopolitics has also helped: in Eastern Europe, the ‘shock’ was the breakup of the Soviet Union and the resulting shift to market pricing. Since 1990, oil intensity of GDP has

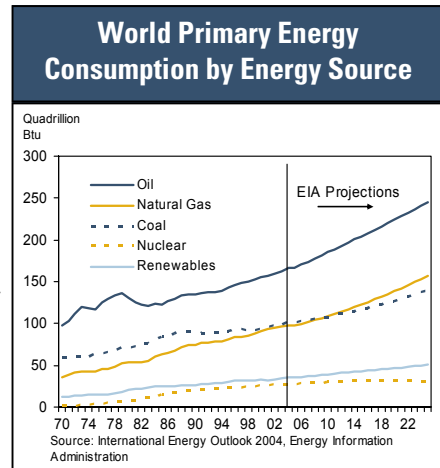
fallen sharply in many Central and Eastern Europe economies, and by nearly 40% in Russia itself, as these countries have shuttered their most energy-intensive industries.

Even in China, oil intensity has fallen by nearly 30% since 1970, despite rapid industrialization. Oil consumption grew at an average of 2% per year in the 1980s and 7% since 1990, but intensity has fallen by an average of 7% per year in the 1980s and 2% per year since 1990.

This suggests that there are few areas of the world in which oil intensity can be reduced significantly from here.

Keep on Driving

A major sticking point in the shift away from oil is transport, which now accounts for over 50% of global oil consumption. This reflects both increased consumption on personal transport—which is set



to rise dramatically in the major developing countries—and the relocation of manufacturing away from end markets in the developed world.

Oil is virtually the only form of transport fuel used around the world, and there are few near- or even

continued on page 4

Copyright 2005 The Goldman Sachs Group, Inc. All rights reserved.

This material should not be construed as an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. We are not soliciting any action based on this material. It is for the general information of clients of The Goldman Sachs Group, Inc. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Before acting on any advice or recommendation in this material, clients should consider whether it is suitable for their particular circumstances and, if necessary, seek professional advice. The price and value of the investments referred to in this material and the income from them may go down as well as up, and investors may realize losses on any investments. Past performance is not a guide to future performance. Future returns are not guaranteed, and a loss of original capital may occur. The Goldman Sachs Group, Inc. does not provide tax advice to its clients, and all investors are strongly advised to consult with their tax advisers regarding any potential investment. Certain transactions - including those involving futures, options, and other derivatives as well as non-investment-grade securities - give rise to substantial risk and are not suitable for all investors. The material is based on information that we consider reliable, but we do not represent that it is accurate or complete, and it should not be relied on as such. Opinions expressed are our current opinions as of the date appearing on this material only.

We endeavor to update on a reasonable basis the information discussed in this material, but regulatory, compliance, or other reasons may prevent us from doing so. We and our affiliates, officers, directors, and employees, including persons involved in the preparation or issuance of this material, may from time to time have “long” or “short” positions in, act as principal in, and buy or sell the securities or derivatives (including options) thereof of companies mentioned herein. For purposes of calculating whether The Goldman Sachs Group, Inc. beneficially owns or controls, including having the right to vote for directors, 1% of more of a class of the common equity security of the subject issuer of a research report, The Goldman Sachs Group, Inc. includes all derivatives that, by their terms, give a right to acquire the common equity security within 60 days through the conversion or exercise of a warrant, option, or other right but does not aggregate accounts managed by Goldman Sachs Asset Management. No part of this material may be (i) copied, photocopied, or duplicated in any form by any means or (ii) redistributed without The Goldman Sachs Group, Inc.’s prior written consent.

This material is distributed in the United States by Goldman, Sachs & Co., in Hong Kong by Goldman Sachs (Asia) L.L.C., in Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch, in Japan by Goldman Sachs (Japan) Ltd., in Australia by Goldman Sachs JBWere Pty Ltd. (ABN 21 006 797 897), in New Zealand by Goldman Sachs JBWere (NZ) Ltd., and in Singapore by Goldman Sachs (Singapore) Pte. This material has been issued by The Goldman Sachs Group, Inc. and/or one of its affiliates and has been approved for the purposes of section 21 of the Financial Services and Markets Act 2000 by Goldman Sachs International, which is regulated by the Financial Services Authority, in connection with its distribution in the United Kingdom, and by Goldman Sachs Canada, in connection with its distribution in Canada. Goldman Sachs International and its non-US affiliates may, to the extent permitted under applicable law, have acted on or used this research, to the extent that it relates to non-US issuers, prior to or immediately following its publication. Foreign-currency-denominated securities are subject to fluctuations in exchange rates that could have an adverse effect on the value or price of, or income derived from, the investment. In addition, investors in securities such as ADRs, the values of which are influenced by foreign currencies, effectively assume currency risk. In addition, options involve risk and are not suitable for all investors. Please ensure that you have read and understood the current options disclosure document before entering into any options transactions.

Further information on any of the securities mentioned in this material may be obtained on request, and for this purpose, persons in Italy should contact Goldman Sachs S.I.M. S.p.A. in Milan or its London branch office at 133 Fleet Street; persons in Hong Kong should contact Goldman Sachs (Asia) L.L.C. at 2 Queen’s Road Central; persons in Australia should contact Goldman Sachs JBWere Pty Ltd. (ABN 21 006 797 897), and persons in New Zealand should contact Goldman Sachs JBWere (NZ) Ltd. Persons who would be categorized as private customers in the United Kingdom, as such term is defined in the rules of the Financial Services Authority, should read this material in conjunction with the last published reports on the companies mentioned herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risk warnings is available from the offices of Goldman Sachs International on request. A glossary of certain of the financial terms used in this material is also available on request. Derivatives research is not suitable for private customers. Unless governing law permits otherwise, you must contact a Goldman Sachs entity in your home jurisdiction if you want to use our services in effecting a transaction in the securities mentioned in this material.

A World Beyond Oil

continued from page 3

medium-term substitutes. Alternative transport fuels are far from commercial viability, given the challenges of scaling up the infrastructure required for fuel production, storage, transport and distribution. In the meantime, the most effective way to reduce oil consumption in transport is likely to be through the promotion of smaller and more fuel-efficient cars. Major government support through subsidies and tax breaks is likely to be important, as it was after the 1970s.

Gas Could Outpace Oil by 2020

Despite all this, there is still more to energy than oil. In fact the world has already begun to transition toward a low-carbon world. Gas, the lowest-carbon fossil fuel, is likely to bridge the gaps in time and technology between oil and renewable non-fossil energy sources such as wind, solar and wave power and biofuels.

The age of natural gas is already a story for the medium- rather than the long-term. If current momentum is maintained, with gas demand outstripping that of oil, gas consumption may overtake oil within the next 20 years. If advances in gas

Transportation as % of Total Oil Final Consumption

	2002	1980
World	57%	46%
Total OECD	62%	49%
Non-OECD Total	48%	39%
Africa	56%	52%
Latin America	55%	53%
Asia (excluding China)	47%	42%
China	39%	24%
Former USSR	53%	35%
Non-OECD Europe	56%	27%
Middle East	44%	44%

technologies make production, transportation, energy generation and consumption processes cheaper and practically feasible, gas might overtake oil as soon as 2020.

Renewables: A Longer-Dated Story

Renewables remain the energy sources of the more distant future—at least for now. But here too there has been substantial progress already. In fact renewable fuels supplied 11% of global energy in 2001, and targets for the uptake of renewables are becoming more challenging.

Wind is the most competitive renewable energy source today, as the cost of electricity produced from utility-scale wind systems has dropped 80% in the past two decades. Some small hydro, geothermal and solar energy installations are also gaining momentum in the wholesale electricity market, though at present these are heavily supported by subsidies. Renewables are particularly important in addressing problems of scarcity and restricted access to conventional energy sources in developing economies and some geographically isolated developed countries.

On a broader scale, however, switching would involve large investments in infrastructure and knowledge, at least at the current state of technology. Apart from the cost issues related to scaling up supply, distribution and consumption, there are also important technical hurdles regarding storage and delivery. The intermittent nature of leading renewable sources, particularly wind and solar energy, means that these sources cannot fully replace existing, more reliable sources.

More countries are now promoting transport biofuels (ethanol and biodiesel) and hydrogen fuel-cell vehicles. Most studies estimate that it is technologically possible to displace at least half of all petroleum transport fuels with biofuels by 2050, although efficient interfuel switching of more than 5%-10% will be difficult without significant shifts in OECD production practices or liberalization of international trade in biofuels. Hydrogen fuel has also started to draw increasing attention as a next-generation transport fuel, but production costs are high, and massive infrastructure investments will be required to make this commercially successful. ■

