the economics are best where there is a consuming market which is ready to pay a premium for such quality.

● ***Do these conditions include existence of isolated far away reservoirs of gas which is not proper for transport, local use or for injection purposes?***

- Yes, where there are no pipelines for local market, you then have to examine whether it will be cheaper to do an LNG project. An LNG project still needs a market for the gas. It is also necessary to test whether you get a higher return from converting the gas into liquid and selling it in the oil market. You have to do detailed engineering, assessment of cost of gas and very particular market studies for both the liquid and the LNG to see which is more profitable.

● ***Do you see any future for GTL?***

- I think there is a future for GTL. It will probably be a niche business in places where you have gas reservoirs which probably can not be converted into LNG.

● ***Have you ever done any GTL projects like SASOL in South Africa?***

- We have done it in our research establishments. We have not done a commercial project in this field. SASOL is doing it from coal. There have been test projects in Malaysia and also one in New Zealand.

● ***What about coal? It is still a major source of energy in the world. It is said that coal is put aside for the moment in favor of gas. But there is a lot of coal in the world.Can we ignore such a big source of energy for ever which is said to have an energy potential five times that of oil?***

- Well, coal is still a main source of energy in many countries, such as China where it provides some $\frac{3}{4}$ of the energy consumption. but there is a declining trend in using coal even in China. I think that now, where consumers are given the opportunity and choice between competitively priced gas and competitively prices coal, they will choose gas. This is partly for environment reasons but also due to the efficiency of combined cycle gas turbines in power generation.

● ***Although the Kyoto agreement on environment protection is not going to be performed by the US?***

- Well, at the moment, it does not look like that the agreement will be ratified by the U.S. government. But there are two factors in this regard. First the consumers want a cleaner fuels in terms of sulphur content, etc. Here gas is preferred to coal. And secondly in a number of countries even if the Kyoto agreement is not ratified globally, they are still taking measures to limit and reduce the emission of greenhouse gases including carbon dioxide. There will be measures taken in countries such as in the U.K. and other parts of the European Union to address the issue of carbon emissions. Even if the Kyoto is not signed, they will still emphasize the role of gas in the future.

● ***So, no future for the moment for coal?***

- Well, there is a future but it is less attractive one against gas. In most countries coal is not the preferred fuel. In the UK there is still coal but they are leaving it under ground. It is more economical and environmentally preferable to burn gas.

● ***What about any impact of biology engineering on energy?***

- I think there is a great future for biotechnology in energy which is in its very early days. I recently heard of a bacteria which releases hydrogen. There many similar stories in this regard. But there are many things to expect from biotechnology in energy which today we can not understand the answer.

There is a lot of technology change in the energy field. I think there are a lot of avenues of technology moving forward. As for the renewable energies, I believe that the solar energy has a very great future. If you look at solar energy, wind energy and many other renewable energies, related technologies are moving very quickly. I think the best example are photovoltaics which generate electricity from solar power rather than using direct solar thermal operation. We have many applications of it. BP Amoco has the leading role in solar power in the world. We are investing very heavily in this field. I think the role of renewable energy is going to be much bigger in future. I am sure that BP Amoco will have competitive technologies in that area.

Another area of activity is hydrogen. In this technique electricity is generated by chemical reaction. Generating power in fuel cells is basically achieved by passing hydrogen over cathodes to produce electricity from a chemical reaction. Now the aim is to try to use it in motor vehicles or in large plants. The technology of fuel cells is now advancing very rapidly. For example Daimler-Benz company will have a fuel cell vehicle in 2004 using methanol and other producers are looking at a gasoline based fuel cell. The technology is basically through using hydrogen which you either use directly or you have a two-stage process where a hydrocarbon is converted into hydrogen and then hydrogen is used to produce electricity. A Fuel cell engine seems to be significantly more efficient than an internal combustion engine. But at the moment the engine is very expensive. I think we will start to see something in 5 to 10 years in this field.

● ***Are these new technologies taken into account when the supply and demand for energy in future are analyzed?***

- Yes, but this is a long-term energy demand forecast which is very unreliable. But I think many forecasts now assume that the rate of growth of demand will slow when these new technologies or some of them come along.

● ***thank you very much for the interview Professor Davies. We hope to see you again here in the near future.***

- Thank you. I look forward to returning very soon. ■

short term oil market so that all participants in the market understand the supply and demand of oil in short term. And they undertake other studies as well to look at the broader energy markets and energy security. They take initiatives to represent the consumers problems and they have held a number of meetings of experts from both consumers and producers first in 1993 in Paris, and later in Qatar, Doha in 1997 and another in Paris late last year. They are meetings of experts to share knowledge, information, understanding of the global energy markets.

● ***So you consider it as a suitable way for stabilizing the market?***

- I think it insures better understanding of the markets. We are less likely to get panic and less likely to make bad decisions - by governments but also by consumers and by companies. The more you share information and understanding, the more likely you are to have stability and to make good decisions.

● ***Do you have any recommendations for OPEC as an economist?***

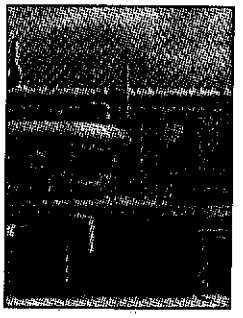
- I think the main one is one of stability: to work together to privide the consumers with security of supply, to insure for consuming countries that they realize that oil is going to be available at a reasonable price at any time. That I think is the main role of OPEC. That means when the markets are going to extremes, willingness to react rapidly and clearly to try to provide stability.

● ***Why do you think that $18 is a good price for oil?***

- That worked for a long time. The price went down below that range for some time and now it is coming above that range.

● ***For oil companies, do you get more benefit in higher prices?***

- We get higher profits when prices go up as producers. But the benefits are limited because taxes are often very high at a marginal rate. But certainly we do not only produce crude oil, we also produce natural gas and the price is often independent. Secondly we are also refiners of oil and we produce petrochemicals. If you look at 1999, though the crude oil price was high, the benefit of this was offset by declining refining margins and chemical prices. Of course our cash flow position is better when the prices are higher.



IEA was created by consuming conntries in OECD particularly to cover emergency preparednessn for oil shortage

Our philosophy is that we know we can not predict the oil price, therefore we always want to make sure that we are a competitive producer of oil and we try to do that at a low cost, So we have been in recent years insuring that our projects are tested first of all at $14 per barrel as a base case. Then we will test if they are still profitable even at $11 per barrel. We need to do that to insure that the company is strong and to insure that we are a competitive producer of oil. So we see to it that our cost will be below the average cost of the last 10 years. I think that most of the leading producers in the industry have got similar approaches.

A number of factors are influencing the level of investment. First of all the level of oil prices has a significant impact upon many companies and their ability to have access to finance to invest. So we saw a big decline in industry in 1999 when the oil prices were so weak. They simply could not afford to invest. There are some other factors to be mentioned. One is that following the mergers the reduction of costs has meant that the spending on investment, has actually gone down in some cases. The volume of investment has not declined but the cost of it has gone down. Because of our merger, we have become more efficient, so we are able to carry out more projects for less cost. So we have squeezed cost out of the system spending a little bit less than that when we were two separate companies, most of this is offset by becoming much more efficient.

The other issue is investment of small companies. These companies have always been doing high risk operations and they have attracted risk capital from investors who are willing to put their money in risky projects. Many of these investors are now asking "why don't we put our money in the IT stocks, in the Internet?", because they see these as new profitable risky investments. What is happening is that some of small companies are finding it very difficult to raise capital and to invest. So we see that some of these small companies especially in the U.S. have not increased their investment even when the price of oil has gone up.

● ***What about BP Amoco, the second big oil company?***

- BP Amoco is now developing a strong growth agenda as the base for a strong long term future.

● ***Have you ever had any projects in the field of gas to liquids (GTL)?***

- BP Amoco has technologies in the gas to liquid area. We have undertaken a number of test programs and we are looking the possibility of commercialising this, most particularly in Alaska. I think it is going to be used where the gas does not have an immediate market, where it is possible to ship the products as a liquid fuel, and where there is a premium for the quality of fuel you get by this technique. Because the gas-to-liquid product is a very high quality fuel, low in sulphur,

go too low, it has willingness to curtail production and stabilize the prices, and when the prices go too high, to make extra production available to stop prices going too high.

● ***It can therefore have a role in stabilizing the market.***

- It can be very successful just as with the Hague Agreement in March 99. This was very successful and it created the psychology as well as the fundamentals to bring prices up from the very low levels from the beginning of 1999. And OPEC's role, I believe, is to provide confidence, to provide the consumers with a sense of security so that they know if they buy any equipment which uses oil, that oil will be available physically and at reasonable prices. That is what OPEC can provide by making clear that there are resources of oil available when needed at reasonable prices.

● ***Do you see the current cut of OPEC production level (with a reportedly compliance of at least 75 percent) in the context of market stability? Because they have shown a continued united position and such a constant position could be in favor of stability since it has been a predictable trend for a relative long period of time?***

- I think the key is that the Hague Agreement provided a floor to the oil price and provided stability to consumers and producers who otherwise would find themselves under financial pressures. What it did was to reduce the world's level of oil production below levels of consumption, so that it was possible to draw down the excess stocks, the excess inventories of oil that had built up throughout 1998. Now you cannot keep the level of production below levels of consumption. It comes to a point when you have to raise the production up again to meet the level of consumption. We are getting close to that point. That is why the price has risen. The issue is how much extra oil the world needs and when. And that I think is the discussion that is taking place currently amongst producing countries and others to assess the need of the world oil market.

● ***You mentioned earlier (in a meeting in IIES) that 1.6 million b/d increase in OPEC production is needed to meet the consumption in 2000 without any negative impact on prices.***

- If you take the forecasts of most institutions, you will find that if the world is to have a supply to meet the demand throughout the year 2000, and by the end of the year you have roughly the same level of stocks as at the beginning of the year, then the world will need from OPEC maybe something around 1.5 mb/d.

● ***Including the amount needed to fill up the inventories?***

- Yes, to keep the inventories at the same relatively low levels as in the beginning of the year. We started the year with a relatively modest level of inventories.

● ***And in your opinion what would be the band of price or fluctuations of price with this production increase?***

- We see that from 1986 to 1997 the average price had been $18 and stayed within about $15 to $21 for most of the time. That was a range which gave the producers adequate revenue and which was not the cause of any serious economic problem for the consumers. So that is, I think, a reasonable range. There is no reason to say why that should rise in the future because the cost of production of oil around the world is actually coming down. The world has discovered lots of new oil and development and production costs are now lower than in the past. Therefore I believe that there is no reason to assume that a suitable price is any higher than what was before.

● ***And in that analysis it is said that non-OPEC production will rise around one million barrel per day in 2000.***

- In the year 2000 it looks like that the growth will be approximately one million b/d.

● ***You mean that all these increases in production will be absorbed by the market with no negative effects, including the rise in OPEC production in March although it is the beginning of the warm season in the west.***

- Yes. The demand in the second quarter is normally weaker but in that quarter refiners are looking for more crude oil in order to produce gasoline for the gasoline season in the summer.

● ***What happens if the current production and consumption is kept in the second quarter?***

- I think that if the current level of production will be maintained, the oil market will be very tight as we go forward. And today's prices are taking into account that expectations of a future market. So today what has happened is that while the fundamentals are tightened, the psychology has also become more bullish and pushed up the prices. It is the combination of them together.

● ***What is the role of International Energy Agency (IEA), what kind of cooperation can one think of between this body and OPEC?***

- IEA was created by consuming countries in OECD particularly to cover emergency preparedness. The main reason for its establishment was to provide protection in the event of a disruption in oil supplies. They would then put in processes and policies to make oil available. So they worked with the consumers and it is the institution of the consuming countries. They coordinate the levels of official stocks and required company stocks for the members of OECD. They have processes for releasing these stocks in the event of possible physical shortages. That is the main role of the IEA.

As a part of it, they believe, I think correctly, that it is valuable for consumers and producers to have better knowledge about oil and energy markets. So they provide data about the

the large amount of assets we have in the United States that we are not prepared to go out and behave as if technically we are a UK Company in the face of that particular piece of reality.

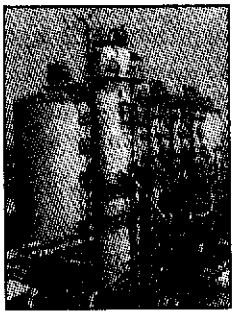
● ***There are reports saying that you are lagging behind many majors in this region. Of course you have been active in Kuwait although you are now running into certain problems there with other companies including a Kuwaiti company.***

- I think that BP Amoco is a very strong player in the region. We continue to have equity investments in both oil and LNG in Abu Dhabi where we have been the leading international oil company for many years. Also within the UAE we operate the Sarja field in Sharjah which is a long-standing Amoco relationship. The other Middle East asset of great substance is Egypt where the former Amoco was active for over 40 years. We are the biggest producer of oil in Egypt and a partner in GUPCO together with EGPC... So we are the largest international operator in Egypt.

Also we have been working in Kuwait since the early 1990's through a technical assistance agreement. I hope we can translate these into investment relationship in the near future. That is in the hands of the Kuwaiti authorities who are still discussing the matter. Meanwhile, we are having dscussions in the Kingdom of Saudi Arabia as well.

● ***As you know, in the oil and gas industry there is a vast field for your cooperation with producing countries not limited just to upstream, but also technical assistance; education and transfer of technology. How do you see this sort of activities in the region and particularly in Iran?***

- I think any company investing in any country is a partner. That involves a transfer of technology. It also involves being a member of the community in any country. So I think that it is a partnership that you create. It is not simply an injection of short term cash; it is a longer term relationship which can be of mutual benefit and one where you are increasing the size of the prize. Both the host country and the investor can gain from that for mutual benefit.



PB-Amoco after the merger is a much stronger player in handling oil and gas around the world

● ***Are you ready to have such a cooperation with Iran?***

- We are looking at opportunities to see if we can do that. We continue to discuss possibilities with Iran's petroleum authorities, but as yet we are not investing. As our discussions with NIOC clarify this may change.

● ***Are we going to see you soon in Iran in this regard?***

- I hope to return to Iran. We always enjoy having full open relationships.

● ***On oil prices and OPEC, can OPEC have the role of a controller of the oil market to regulate it when prices go to extremes instead of engaging in a tug of war with consumers?***

- I think that oil is by nature a very volatile commodity. A feature of oil is that it is such an important commodity for many producing countries such as Iran. It is the main source of foreign exchange, the main source of government income, and it generates many jobs. There are many other countries where this is the case.

So I think for both producers and consumers, we risk having a very volatile oil price. Throughout history there have been mechanisms in place which have tried to reduce this volatility, to reduce the range in which price might be kept. OPEC has been one of them, also the major oil companies for periods back in history.

We have just come through a period of a great change with prices going down below $10 a barrel as we went through 98 and 99. Prices are now exceeding $25. So even with mechanisms for creating stability, we still have a natural tendency for a volatility for prices.

● ***What is the best way of shifting the dependence of oil markets from psychological factors to the fundamentals?***

- Well, every market is a mixture of fundamentals and psychology. When you go to buy oranges in any local market, for example, if people fear that they will not be available tomorrow or only available at a higher price tomorrow, they will buy more today and the price will rise today. The market is what the balance of the forces are in the world. It is the balance of buyers and sellers and there is always the element of psychology. Your willingness to buy and sell is dependent on price, volumes available, what you think is going to happen in future. So psychology will always be a factor in the market.

● ***I mean the shift of percentage of psychological factor vis-a-vis the fundamentals.***

A: That is not something you can define in the market activities. What you see in the oil market is psychology which is driven by fundamentals.

● ***Can a strong OPEC be an effective element in shifting the market trend toward the fundamentals and thus leading to more stability in the oil market?***

- I think OPEC can have a very positive impact on the price by making clear that its role is to reduce the volatility of the market.

● ***How can it do that?***

- by indicating that when the prices

- well, if you want to. So what we find now is that some companies can withdraw from one part of the market. For example Texaco withdrew from petrochemicals.

● ***What sectors do you want to withdraw from?***

- We have not withdrawn from any sector but our view is that in many areas we find that refining as a sector is not attractive as other parts of our industry. So we emphasize our strategic thrust in upstream oil and gas development, production and transportation, and the retailing of gasoline. We tend to underemphasize and reduce our investment in refining because we think that is in a number of instances not an attractive business. We could not do it in the past because your production needed to match more closely with refineries, with the markets. Now it is possible to reduce your exposure to a specific sector. So, we may find in some countries a company which is a retailer in gasoline and is also a producer of crude oil but owns no pipelines. The industry is now such that there are markets. So any retailer of gasoline can buy gasoline from a refinery, from a spot market or from wholesalers.

● ***So your main activities are focused on upstream oil and gas and retail in gasoline.***

- And in petrochemicals as well. Of course we are still refiners. In the old industry of 20 years ago to be successful you operated as an integrated capacity all along the chain. Now you have a choice to join the industry just to sell gasoline or you can produce crude oil and not sell gasoline if you wish. It is up to you.

● ***Do you think that such specialist companies can be set up in countries like Iran? What field of activity do you recommend for such a company?***

- I think that NIOC as a state company has obligations to the government to undertake certain functions, whether it is in exploration, production, refining and marketing. But if you are a private company operating around the world, you can choose any part of the business that you want. I think the key to the whole industry is having skills and capabilities. What I think is that any company which wants to be successful should make sure that it is run by the entities with the best skills. I think it applies also to state companies.

● ***We may go on with the subject of mergers.***

- Yes. These increases in competition reduced the return and the profitability of the oil industry. You can look at a lot of data which will show you that the oil industry was making less returns than other sectors around the world. So the oil industry was challenged to access capital, challenged to be able to compete to attract, in face of competition, capital from other industries- whether it is the IT business, the media, it does not matter. The industry was not creating enough return.

● ***Even in retail business?***

- The retail business has not been profitable in many countries. There are often too many fuel stations to operate efficiently. Periodic price wars are common in many mature markets such as the UK.

During 1990s you can look at a lot of data from many of the banks which will show that return on capital of the oil business was less than the return of capital of the average of the whole stock market. And what that meant was that the industry had to do something about its profitability or lose capital. We tried cost reductions, we tried improving portfolios, we tried joint ventures. These all helped a bit but it was not sufficient to turn the corner. And the mergers, I think, were driven by this phenomenon.

Also deregulation and creation of new competitors all way round the world meant that the industry became more and more competitive. If you were going to stay profitable, you had to find ways to become even more competitive. Mergers had the ability to reduce costs of big companies like BP Amoco. The company had the ability to improve the quality of its portfolio. In BP Amoco's position, we created a global gas company as well as a global oil company. That allowed much stronger company results. Now BP Amoco is the leading producer of natural gas in North America, also the leading producer of natural gas in the U.K. and a leading player in the world LNG business as well. The merger brought skills together of the two companies and allowed the company to be of sufficient size, structure and strength to be able to enter into new markets and to undertake major projects without having to bring in many other partners and share.

● ***Would you please explain about the Arco and problems arising in the way of merger with it?***

- There is very little to say about Arco because it is in litigation, so the lawyers will always limit what I say. The process is still due to go to court. We believe that we have a strong case and we hope that it can be resolved. But this is in the hand of the lawyers, not economists.

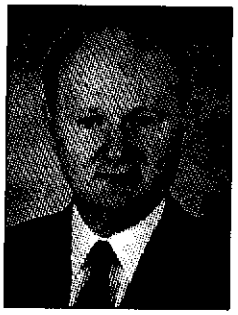
● ***Are there any limitations for BP activities after the merger with Amoco? If you had not shaped a merger with Amoco, would BP have had better opportunities for making agreements with Iran?***

- After the merger, we are a stronger company with stronger skills in handling both oil and gas which, I think, makes BP Amoco a much stronger player around the world in gas resources as well as in oil resources.

● ***One can expect, therefore that you will have a stronger presence in the region and in Iran in particular in the upstream.***

- We are looking at a whole range of opportunities throughout the Persian Gulf area.

On Iran, as Sir John Browne has said, we have been very clear that given



Interview with Professor Peter Davies

vice president and chief economist of BP AMOCO and president of the international association for energy economics

● ***Is the BP Amoco merger due to the fall in oil prices? If not, what is the main reasons of such a decision?***

- I think the main cause of the mergers goes a long way back. They are not simple developments over one year, but they are driven by longer term forces in the energy industry. these are basically that the existing or previously large oil and gas companes in the world were going through a transition because of a number of broad factors. First the competitive advantage of the majors in the oil business had been driven to some degree from the small number of large profitable fields particularly in the US, such as Prudhoe Bay in Alaska, in the UK in Forties and Brent, and a mixture of other fields. These were very large multi-billion- barrel fields which were profitable, generated lots of cash and were core to these corporations. These fields have now moved into decline and while we continue to invest in them, the total production levels have fallen and the income to companies from these fields have declined. So, these key strategic assets in the 80s and in the early 90s have begun to fall back.

The companies have replaced these fields in aggregate terms so the total level of production have often remained the same but the new fields are generally smaller and they have generated less cash, usually being on tighter fiscal terms as well.

Therefore the performance of these companies was under greater and greater pressure all the time. They went out to try to reduce costs, to improve profitability. but this worked only to some degree.

At the same time, we were seeing a number of other things. We were seeing a change in the competitive market place. First we saw that some of the state companies, many of which had been created in 70s and 80s, have either been privatised (as in the case of Total of France, Eni-Agip in Italy) or were commercialised. Moving from being pure arm of government they became commercial companies. The international industry suddenly found itself with a huge number of new companies competing not only in their own countries, but also outside of their own countries. So we saw Petronas of Malaysia moving into the international upstream and downstream, and CNPC of China moving into the upstream business. So, the intensity of competition began to change the business. And now you also got two or three other types of new players as the geography of world energy industry changed. As Asia and Latin America grew rapidly, newcomers emerged in these countries which were very competitive in their home countries and became big players as a result. Two specific examples are the refiners of Korea, who are now very big oil companies, and also in Argentina where YPF, the state company which was privatized then became a regional player (it has now merged with Repsol of Spain). There are also new players from Russia in the international business of oil and gas. So, again we found in the emerging market new players.

● ***Are there any such companies in the Persian Gulf region and Arab countries?***

- Not particularly, one or two very small private companies. That might happen in the future, but we have not seen it yet. We have also seen in the more mature industrial countries a number of other new players. In the U.S. now almost 15% of the refinery capacity is run by new companies. There are new refiners such as Tosco, Valero, and Clarke who have moved into the refining business as specialist refiners and have become very strong players. We then see in the retail business in Europe the supermarkets, in U.K. such as Tesco and Sainsburys and in France Carrefour who not only sell groceries but also gasoline to the same customers and these are again all very strong competitors.

What that means is that we have seen new players and much more competition within the industry.

Now at the same time the industry used to be integrated; it used to be dominated by the majors, which were producing at the well head, and refining, shipping, marketing and as a single operation. But during the last 20 years spot markets have developed all the way along the chain. There is active trading between crude oil and products and all different types of products in different places all the way along the industry. That means now that you can enter the industry just to do one thing. You can just be a pipeline company, just a gasoline seller, you can just sell aviation fuel, you can just be a refiner.

● ***Is that the ease even for the majors?***