BIAC/OECD/IEA Workshop on Climate Change:

INDUSTRY VIEW ON THE CLIMATE CHANGE CHALLENGE WITH SPECIAL EMPHASIS ON THE KYOTO MECHANISMS

Paris, 8 March 1999

Industry Sector Reports

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BIAC/OECD/IEA WORKSHOP ON CLIMATE CHANGE:

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OIL INDUSTRY

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The oil industry is large and varied. It is composed of large privately owned companies that are engaged in all aspects of the business, such as Royal Dutch Shell, and much smaller firms which only participate in a specific aspect of the business. It also includes state-owned companies, many of which are very large, sophisticated and intent on expanding their operations beyond their borders.

Industry members participate in various aspects of the business, including finding, producing, transporting and refining crude oil and manufacturing, transporting and marketing oil products, such as gasoline and lubricants, to mention a few. Many use these products as feedstocks for their chemical operations. Members are also the large participants in the natural gas industry, as well as important players in the growing alternative fuels business. Finally, industry members participate in these activities around the world, in both Annex I and non-Annex I countries. Mobil, for example, operates in over 140 countries.

Obviously, an industry this large and varied will not have a single view or position on climate change, the Kyoto Protocol or the Kyoto mechanisms. Some, like Shell, are committed to taking action on climate change now and support the Protocol. Others, like Mobil, oppose binding targets and timetables at this time due to the high level of uncertainty about the timing and magnitude of the possible impacts of greenhouse gas emissions and the economic dislocations that may result. Variations of these positions are probably held by many of the other members.

1. Voluntary or Negotiated Agreements

Regardless of their positions on climate change, most industry members agree that action can be taken now to voluntarily reduce GHG emissions in their operations or in the use of their products. Many have been taking these actions for several years. The justification for these actions, if one is needed, can be based on the precautionary principle, the desire to be a good corporate citizen or that it simply makes good business sense to take actions that are economically viable in their own right.

Industry members make these voluntary reductions in many ways. They may make them on their own, without relation to any government program, or they may participate in voluntary programs sponsored by the countries in which they operate. For example, Mobil participates in every voluntary program in the US Climate Change Action Plan that is applicable to our business. We do the same in other countries with similar programs. Members may also make these reductions by negotiating voluntary agreements with governments, e.g. Australia.

One thing which can make voluntary programs more effective is education: exposing other companies to the opportunities of making cost effective reductions; and advertising to the public the fact companies are making these reductions voluntarily. However, one thing that will discourage companies from participating in these programs is to disguise them as mandatory programs.

2. Flexible Mechanisms (General)

Various economic studies have shown that capturing opportunities to reduce GHG emissions wherever they are least costly ("where flexibility") could significantly reduce the global cost of achieving specific emission reductions. Scientifically, reducing GHG emissions anywhere in the world will contribute equally to slowing the increase in their atmospheric concentrations.

The Protocol recognizes the importance of *where flexibility* and reducing GHG emission costs by the inclusion of three flexible economic mechanisms: the Clean Development Mechanism (CDM), Joint Implementation (JI), and Emissions Trading. These Kyoto mechanisms hold the prospect of lowering emission reduction costs that would be required by the Protocol if the rules, modalities and guidelines for their implementation encourage business participation, keep restrictions to a minimum and provide for low transactions costs.

Since the Kyoto mechanisms are a means of meeting the Protocol's cap on Annex I country emissions, member support for them varies with their support for the Protocol. Those favoring the Protocol generally support the mechanisms as a cost-effective means of achieving the mandated reductions and would like to see them implemented quickly. Potential problems could be resolved as they arise. Those opposing mandated reductions at this time generally recognize the mechanisms are important to reducing the cost of compliance, but believe they shouldn't be put in place until ratification.

Many industry members currently participate in voluntary projects around the world that could meet the definitions of the Kyoto mechanisms. If emission reductions shift from being voluntary to being mandated, the need for lower emission reduction costs will increase as will the importance of the Kyoto mechanisms. Thus, it is difficult to envision the Kyoto mechanisms as being particularly effective without relation to an emissions cap.

3. Credit for Early Action

As mentioned, most members already participate in voluntary actions that reduce their emissions. Many probably believe that they should be recognized for the proactive approach they are taking. However, receiving a credit for these voluntary actions is only important when and if the Protocol is in place with its mandatory reductions. So, industry support for credit for early action falls along the lines discussed above. Members that support ratification of the Protocol will agree with the need to reward companies that begin to participate in these mechanisms and achieve reductions immediately. Others will feel that receiving such credit is appropriate only if the Protocol is ratified and when the Parties to the Protocol begin to implement the mandated reductions through their domestic programs. At this time, each country will determine the content of its program and whether it will include a cap and trade system. If it does, an allocation system will be necessary which should include a method of recognizing those companies that had taken early action.

4. Clean Development Mechanism (CDM)

Industry members are active in many of the non-Annex I countries and participate in projects that could be candidates for the CDM. Others could find that projects in these countries become more interesting because the CDM could allow them to gain Certified Emission Reduction (CER) credits for use in their businesses or to sell as assets. However, these credits would only have value if there is a cap on emissions as is contained in the Protocol.

A properly designed CDM could encourage projects that promote technology transfer, support capacity building and promote internal investment in non-Annex I countries, while allowing Annex I countries to lower their emission reduction costs. The CDM could also encourage industry members to consider the GHG implications of their projects, and, where economically feasible, include technology and operational features that reduce emissions. The CER credits would be the financial incentive that could encourage members to undertake these additional actions. To be of interest to an industry member, CER credits must be readily tradable in an international emissions trading system and the administrative burdens and transaction costs kept to a minimum.

A critical aspect of the CDM will be the definition of additionality. The baseline for determining additionality should be based on technology that is commonly used in the host country and not on the best available technology or the amount of money spent on the technology. For example, if a country's electric power generation is predominantly coal-fired, then any technology which has lower GHG emissions than the current industry standard for coal-fired electricity generating equipment should qualify for CER credits. The baseline may rise with time as lower GHG emission technology becomes more common, but it should change only when that technology has become the industry standard in that country.

Other issues that could promote the acceptance of CDM would include the protection of confidential business information, since the projects will involve the use of advanced and proprietary technology. Information required from project participants should be limited to that necessary to demonstrate their projects are consistent with the host country's sustainable development goals, determine additionality, and monitor and verify project performance. To the extent possible, the CDM should use existing institutions to implement its activities and if new institutions are needed, they should be staffed with professional personnel.

5. Joint Implementation (JI)

For most industry members, participation in JI projects would be similar to CDM projects, except they would be conducted in Annex I countries. The economic drivers that might encourage members to conduct CDM projects would be the same for JI projects. To date, all JI projects have been conducted in Annex I countries with economies-in-transition, an area in which our industry is particularly active. A properly designed JI program could achieve the same important goals in these countries (as well as in other Annex I countries) that CDM could encourage in non-Annex I countries.

The same conditions that could support a company's involvement in CDM projects would determine whether a company participates in the JI program. For both the CDM and JI programs, industry members would evaluate the economic incentives that the credits for emission reductions could provide. If there is no emission reduction mandate, incentives for these projects will be lessened and they would be taken only as voluntary actions.

6. Carbon Sinks/Sequestration

If the Protocol were ratified, most industry members would support the development and inclusion of sinks as a policy option and a means of reducing the negative economic impacts of emission reduction. A broadening of the definition of the enhancement of sinks to include the protection of existing forests, changes in agricultural practices to increase sequestration in the soil and, if feasible, carbon sequestration in the ocean would increase the effectiveness of this proposal.

7. Emissions Trading

As with the other two Kyoto mechanisms, if the Protocol is ratified, emissions trading is another means of lowering emission reduction costs. As envisioned by the Protocol, emissions trading is to be conducted internationally among Annex I Parties. In order for an international emissions trading system to be effective, several concerns should be addressed. First, the Parties should clearly establish that companies are permitted to participate in international emissions trading. Second, permits from international and any national emissions trading systems should be freely exchangeable. Third, companies should be permitted to trade credits obtained from JI and CDM projects in both the national and international emissions trading systems. Finally, emissions trading should be conducted either directly between companies or through existing market-based institutions, such as commercial and financial exchanges, whenever possible. The Parties also should establish procedures to verify and report trades. Examples of existing successful exchanges may provide sound models for design of these procedures.

Without the Protocol, it seems the incentive for voluntary trading will be lacking. It is possible that some industry members may engage in voluntary trading, as one industry member already has done with an electric utility. However, without the mandated emissions cap contained in the Protocol, there would be little economic incentive to trade, other than for the general reasons for supporting voluntary action.

The sulfur dioxide trading under the US Clean Air Act is often cited as a model for how an international GHG emissions trading system might work. However, the US sulfur oxide trading program is limited to a single gas (SO_2) and a single industry, electricity generation. The provisions of the Clean Air Act apply in a single, domestic regulatory framework, with well-established procedures for monitoring and enforcement. The sulfur dioxide allowances are traded in an existing commodities market, the Chicago Board of Trade, and through brokers, with the US government deriving no revenue from either the initial allocation of allowances or subsequent trades.

The biggest difference between US sulfur dioxide trading program and an international GHG emissions trading proposal would be the scale of the task. When sulfur dioxide trading was proposed, there was known technology, the stack gas scrubber, which could meet the emissions limitation cap. The costs of this technology, while substantial, were well understood. At this time, the costs of meeting the emissions caps set by the Kyoto Protocol are not well understood, and, in all likelihood, much of the technology needed to meet these caps economically is not available.

Sulfur dioxide trading has been viewed as a great success since allowances have traded at prices well below those estimated when the system was conceived. However, it is important to realize that not all of the cost reductions can be attributed to the trading program. For example, early in the program the US deregulated its railroads, which significantly reduced the cost of transporting low-sulfur coal to utilities using coal. As a result of the emission trading program, utilities were able to take full advantage of these cost reductions. Under a conventional regulatory program they might not have had that opportunity.

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GAS INDUSTRY

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1. Introduction

Natural gas accounts - at 1,810 mtoe - for 20 % of world energy consumption. According to forecasts by the World Energy Conference, worldwide gas consumption will rise to 3,468 mtoe in 2020, the share then being 23 %. About a third of this gain will occur in OECD Europe.

The major driving forces behind the increase in the use of natural gas are its high environmental compatibility and the superior efficiency of gas-fired power station technology. In the opinion of the Club of Rome, natural gas should act as a bridge facilitating the transition from present carbon-containing energy supplies to a low-carbon or carbon-free energy age. The formulation of an international climate protection policy on the basis of the Kyoto Protocol and the Buenos Aires Action Plan (BAAP) is therefore of fundamental significance for the gas industry.

2. Kyoto Protocol Implementation

Baselines: Natural gas is in a special position when it comes to the Kyoto goals. It is part of the problem in that it contributes emissions of carbon, methane, and nitrogen oxides, which are all climate change gases. However, first of all it is an important part of a realistic and efficient solution. Because natural gas contains roughly half the carbon content of coal, replacing coal-fired plants with clean, efficient combined cycle power plants that use natural gas can reduce carbon emissions significantly. In fact, the United States based Gas Research Institute has estimated that carbon emission savings due to fuel switching and repowering can be up to 135 mmt of carbon equivalent from current emissions by electric utilities.[*] The special role that gas can play in climate change makes baselines especially important to the gas industry.

If Kyoto targets are formulated on the basis of historical emissions, the gas industry may be expected to reduce emissions of carbon dioxide and methane from 1990 levels or be forced to buy emission credits at the same time that gas use is increasing by replacing a different fuel. The industry feels that this would be an unfair treatment of natural gas and that standards other than historical emission levels should be used to determine emission targets and to measure emission reductions. These could include output-based standards, in which credit is given on the basis of a useful output like electricity. Using output-based standards instead of historical emissions as the baseline has the added benefit of encouraging energy efficiency. Other baselines might also be plausible.

3. Flexible Mechanisms

The unique position of the natural gas industry means that careful consideration must be applied to the initial allocation of emission allowances (more properly, assigned amounts). Done incorrectly, governments might penalize an industry that could be part of the greenhouse gas reducing solution. Once national and sectoral or company-level emission targets have been set and assigned amounts allocated, industries should be given

[*] *Global Climate Change Discussion Paper,* INGAA, August 1998.

maximum choice and flexibility in reaching their targets. We know from theory that more choices will lower the economic costs of compliance with the Kyoto Protocol. The natural gas industry therefore supports emissions trading, joint implementation (JI), and the clean development mechanism (CDM) as cost-effective, appropriate means of meeting the Kyoto Protocol goals.

Emissions credit trading and assigned amount trading under a cap will encourage innovation and allow industries in Annex I countries to undertake the most cost-effective emission-reducing activities. While the number of assigned amounts required for compliance by the gas industry will depend upon the standards used to determine emission targets, the gas industry is already involved in many projects in countries in transition and in developing countries.

For example, natural gas is increasingly being turned to as an environmentally friendly fuel in energy-hungry countries like China. In early 1998, Texaco Inc. signed a contract with the China United Coalbed Methane Corp. to recover 500 million cubic meters of methane per year from coal and gas fields in Anhui Province, China. These recovery efforts will help prevent methane from escaping into the atmosphere. Several other multinational firms, including Chevron Corp., ARCO, Unocal Corp., and Enron Oil & Gas Co., have also signed natural gas exploration contracts in China.[*] Ruhrgas has developed a joint implementation project with Gazprom to optimize the operation of Gazprom's transmission system which comprises some 150,000 km of pipeline. This project is a convincing example of the effectiveness and efficiency of joint implementation. It leads to a very attractive win-win situation in terms of money savings, improvement of energy efficiency and reduction of CO_2 emissions. In addition to this economic and ecological dividend, it has also the political benefit of strengthening east-west cooperation. These examples illustrate the success potential of joint implementation as an effective instrument already put to practical use.

With JI and CDM credits available, developers of projects will have an added incentive to use clean technologies and fuels, and developing countries will benefit from the increased use of environmentally friendly fuels like natural gas. These projects could generate reduction credits that could be used to meet the national and sectoral or company-level targets. An international system to review projects and certify the validity of these credits could be established and, if it were under the auspices of a respected international organization, it would have the integrity required to achieve commercial acceptance. On the other hand, it may be wiser to have the private sector play a more active role in quantifying and certifying emission credits under guidelines developed by organizations like ISO or other standard-setting groups. Thus private-sector firms would compete to provide high-integrity services at the lowest cost, faster and more reliably than competitors. The gas industry believes that there are numerous opportunities for additional projects that can be developed under the CDM and JI programs.

4. Voluntary Agreements

In the U.S., gas companies have participated in a joint U.S. EPA and industry initiative called the Natural Gas STAR program to reduce and avoid methane emissions. Participants report annually on emission reductions achieved through activities such as equipment replacement, enhanced inspection and maintenance, and improved operations management. In one project, Enron Corp used an innovative system to measure pipeline leaks and reduced methane emissions by 11,000 ton in 1997. The EPA estimates that companies in the program together avoided 0.142 mmt in 1994, 0.185 mmt in 1995, 0.208 mmt in 1996, and 0.263 mmt of methane in 1997.[**]

Barriers to participation in additional voluntary programs include uncertainty about the baseline that will be used to implement the Kyoto Protocol. The gas industry is reluctant to do too much in the absence of assurances that it will not be required to implement reductions from current emission levels and that it will receive credit for work already done.

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[*] *Natural Gas Gains Momentum*, The China Business Review, July/August 1998.

[**] *Emissions of Greenhouse Gases in the United States 1997*, Energy Information Administration, Washington DC 1998: 29.

In Germany and other European countries, industry has worked closely with governments to establish voluntary commitments. In 1996 German industry, for example, signed a voluntary commitment to reduce specific energy consumption by 20 % by the year 2005 (base year 1900). Sectoral targets vary from -30 to -15 % of GHG emissions, either in absolute or in specific terms.

The German gas industry is also involved in this agreement. It has made the most ambitious and far-reaching commitment of all branches of industry. It has pledged to reduce specific CO_2 emissions in the residential and commercial sector by 25 % until 2005 as against 1990 figures. In sum, this means a reduction of approx. 40 mmt per year. Compared with total CO_2 emissions in this sector, this represents a reduction of 40 %.

Two monitoring reports stated that voluntary agreements are a successful, efficient and generally accepted instrument. It links binding commitments with a high degree of flexibility at the implementation level, freeing the state from having to implement costly control and enforcement measures. This leads to effective and friction-reducing integration of climate targets in entrepreneurial decision-making.

5. Sulfur and Carbon Trading

National and International Differences: The U.S. sulfur-trading program has been held up as the model for an international carbon emissions trading program. However, there are important differences between the two programs that must be acknowledged. The most obvious difference is that sulfur trading occurs on a national level and is designed to meet domestic U.S. environmental goals. Trading of carbon will be international and will be the first such program designed to accomplish an international aim. The sulfur-trading program requires the use of continuous emission monitors, a costly technology that will not be required worldwide for power plants. The sulfur-trading program was built on 14 years of experience with domestic US-based emission credit systems and 14 years of experience regulating sulfur under local air quality control programs. Neither circumstance exists with respect to international or even domestic greenhouse gas trading programs.

The international quality of a carbon trading system raises several challenges not faced by a domestic program. The first is enforcement. In the U.S., regulators fine or shut down sources that are not meeting their obligations under the sulfur-trading program. Sources that do not have sufficient sulfur allowances to cover their emissions are subject to strong penalties, with authority for this task given to the EPA by the U.S. Congress. It will be more difficult for an international body to enforce compliance with the Kyoto Protocol, and it is unclear what legal remedies will be available to deter and punish noncompliance. Several further questions are raised: Will emissions trading under Article 17 be encouraged among companies as opposed to among countries? Will entire countries be responsible for the failure of certain companies within them to comply? Are economic penalties a practical enforcement tool? And in an international context, is it more appropriate for buyers of credits that are not surplus to be held responsible, or for sellers?

6. Early Action Crediting

Another important difference between the sulfur and carbon trading programs is early action crediting. In the U.S., once the sulfur control program was approved by the government, offset-capable sulfur credits are given to certain sources as a reward for making reductions earlier than they are required by the regulations. These early credits are then added to the total sulfur cap and can be used, traded or sold by the company that made them. Early action crediting therefore increases the total number of credits in the sulfur-trading program. In contrast, the Kyoto Protocol does not allow developed countries to add credits given out to companies for early action credits to their compliance caps. Instead, they must be subtracted. This means that companies not receiving early action credits may face stiffer compliance targets than they would have in the absence of early crediting. This is an important difference between the two programs that should not be ignored.

A second difference is that early crediting under the US sulfur-trading program was built into the legislation. Under proposed greenhouse gas early credit programs, credits would be granted before there is national legislation creating the regulatory framework for greenhouse gas control. To some people, this seems like a cart-before-the-horse policy formulation that is full of potential for negative unintended consequences. However, early incentives and early crediting might be policies that create economic and environmental benefits. Careful thought most go into the development of an early crediting program to be sure that countries and companies do not back into a full regulatory program which was not intended and imposes burdensome costs on others; instead the program must provide environmental benefits and send the right economic signals to industry. This is a complex task, but it is a task that can be done.

7. Conclusions

The gas industry supports the use of flexible mechanisms, especially voluntary commitment, JI, CDM and emissions trading. It is already involved in efforts to develop projects in several developing countries, and welcomes added incentives for the increased utilization of clean, efficient technologies and environmentally friendly fuels like natural gas.

The gas industry is optimistic that it will be able to play a major role in meeting the Kyoto Protocol goals. In order to do so, however, emission targets must be set in a way that does not penalize natural gas in relation to other kinds of fuels. If global natural gas use is to increase, targets have to be defined so that the industry is not penalized for emissions related to increased utilization required to effect end use reductions. The gas industry therefore believes that a 1990 baseline or historical emissions levels are not appropriate for issuing greenhouse gas credits or measuring reductions. With the correct regulatory structure in place, the gas industry is confident that natural gas will be a powerful tool in the mitigation of climate change.

NOTE: John Palmisano and Klaus Kabelitz wrote this paper. The natural gas industry is a large, international, and diverse industry. While the opinions expressed in this regrettably short summary reflect the views of many in the industry, it is impossible for any two people to express a single view on such complex issues on behalf of a worldwide industry. Others in the industry may have contrary views.

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THE OUTLOOK FOR COAL

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Given its size, reserves and global production and consumption base, the global coal industry will continue to play a key role in the 21st Century. However, the coal industry faces substantial challenges that will impact on the future size and profitability of the industry worldwide.

The coal industry is geographically and politically diverse. It is international with producers and consumers located in countries covering each of the key political groupings within the climate change debate as it is now manifest in the UNFCCC and its offspring document the Kyoto Protocol. Individual companies hold views across the full policy spectrum in the climate change debate. These views often reflect the circumstances of the company's production or marketing interests.

Half of the global coal consumption is in countries listed under Annex I of the Kyoto Protocol.

The future of the industry will depend on how a number of risks or uncertainties are addressed over the coming decade. Predictions for the coal industry are listed below:

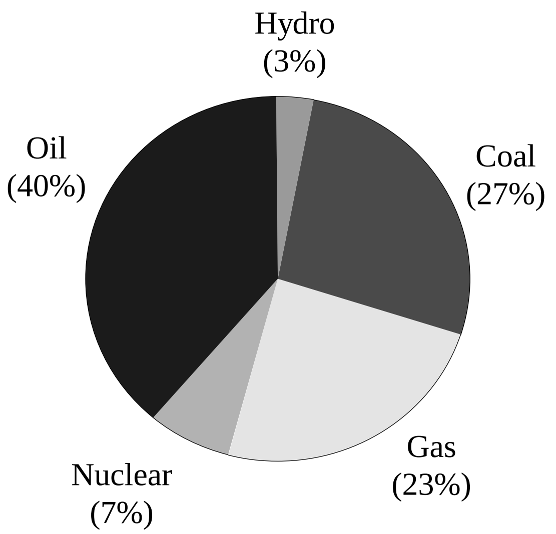
- coal production worldwide will continue to expand.
- coal will continue to be a cost-competitive source of fuel for electricity generation.
- the international traded coal sector will continue to grow.
- coal will remain a key industry input for steel and cement industries.
- like other fossil fuels, coal will continue to come under environmental scrutiny and be required to improve its environmental credentials across the life cycle.
- the political risk profile is complex and growing.

Coal supplies over one-quarter of the total global primary energy demand and will continue to be a key partner in the energy sector and contributor to improving living standards worldwide (see Figure 1).

Global electricity generation from coal at around 36% of total world electricity production camouflages major variations in individual countries - for example, in Japan coal's share is around 15% compared with USA around 57% and China at 80%. (The EU15 obtains around 29% of its electricity from coal.)

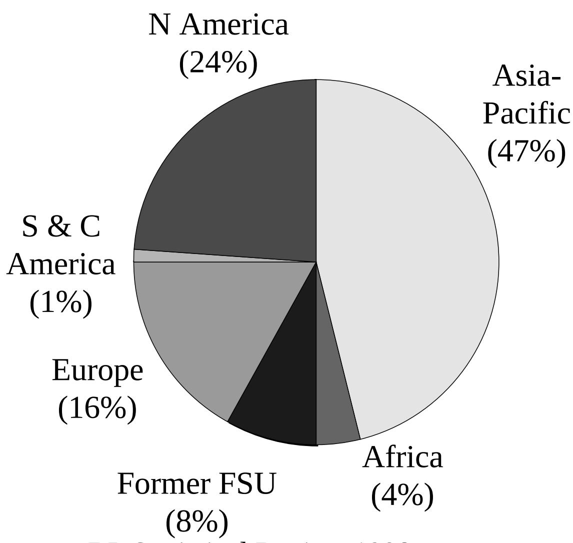
Figure 1

World Primary Energy Consumption (% by fuel – 1997)



Source: EIA International Energy Outlook 1998

World Coal Consumption (by region – 1997)



Source: BP Statistical Review 1998

Industrial consumption of coal in cement and steel production is also a significant market for the global coal industry. About 70% of global steel production is dependent on coal resulting in annual consumption of some 600 million tonnes (Mt) - around 16% of total worldwide hard coal production. (Coal usage by the steel industry in Japan accounts for half of total coal consumption – around 65 Mt.)

Current international hard coal trade amounts to just over 500 Mt per annum, representing only about 13% of total world production. The international coal market is very competitive - and offers security through diversity of supply. The market is characterised by its flexibility and ability to adapt to change, which has allowed for the entry of Indonesia, Colombia and Venezuela to share in the growth. The USA, with its large production capability, acts as a swing supplier.

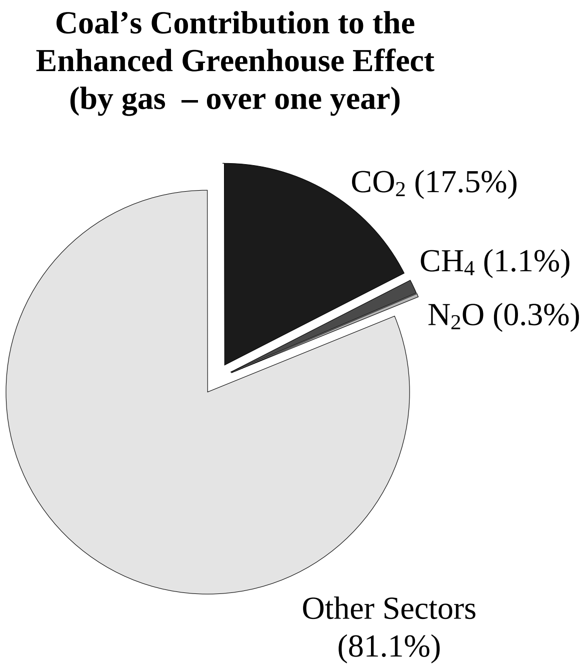
Over 60% of the trade is steam coal, which has grown at just under 10% per annum since 1980 – on the strength of demand growth for electricity – and is forecast to continue at this rate. Coking coal, used as both chemical reductant and fuel in making iron and steel, has grown at slower rates more in line with the global industrial growth. International trade in coking coal is dominated by supplies from three major countries - Australia, the USA and Canada - which supply some 87% of the demand for high-grade coking coals.

Most steam coal is used in power generation. The growth in the Asia-Pacific coal market has been most marked, and is of course supported by the rapid growth in demand for electricity. This reflects both population growth and an increase in demand from very low per capita levels of consumption.

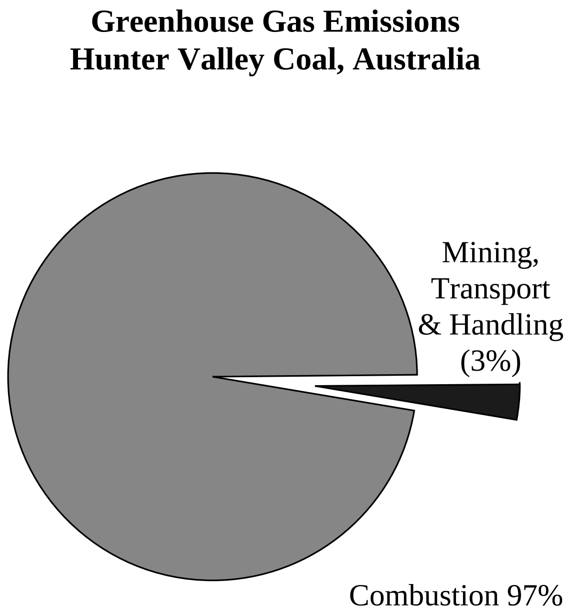
Political risks are growing – they have grown over the past few years and this trend is likely to continue. Just as there is a public – and political – concern over nuclear safety and environmental issues, there is also a concern over the contribution of fossil fuels to possible global climate change through an enhanced greenhouse effect.

Coal's contribution to the enhanced greenhouse effect is about 20%, half of which arises from power generation (see Figure 2).

Figure 2



Source: IEACR



Source: IEACR

The greenhouse gas (GHG) emissions profile of the coal industry is dominated by emissions at the point of consumption – that is, emissions from combustion.

For the coal mining operation, methane is the key GHG. Coal mining activities only account for 7% of total global methane emissions. (Other GHG emissions come mainly from energy use at the mining/processing operations.) Methane – a greenhouse gas - is 20 times more potent than carbon dioxide in terms of its enhanced GHG potential.

Underground mines produce almost all (95%) methane emissions from coal mining, even though they only represent 54% of world coal production. This is due to the shallow depth of the surface reserves where the methane has not been trapped to the same extent – and the fact that most of these coals are lower in rank and therefore do not contain as much gas.

Techniques for removing methane from underground mines have historically been developed for safety reasons. These same techniques can, and have been, adopted to recover methane so that the energy value of this fuel is not wasted. Both high and medium quality coalbed methane (CBM) can be used for on-site power generation, in gas distribution systems and industrial use. High quality CBM is also used as a chemical feedstock.

The CBM recovery and utilisation industry is developing and expanding quickly. CBM activities take place globally with annual production of >30 Bm^3/year. The countries with the greatest potential are economies in transition (EITs) and the developing nations - China, India, Poland, Russia and Ukraine.

In the US CBM has become an important source of natural gas, accounting for around 5% of all US gas production. As a result of this level of exploitation, most technologies for the capture, processing and marketing of CBM have been developed in the US.

A review of the licencing system will take place in the UK to enable companies to take advantage of CBM reserves, which until now had been hindered by a licencing system designed only for conventional oil and gas exploration.

A recent study (Thakur 1996) estimates total methane emissions from coal mining at 25 Mt, of which about 4.3 Mt (17%) are actually recovered, but only about half (2 Mt) are utilised.

Globally, the potential methane recovery level from coal mining activities has been calculated at being between 25 – 45% once geology, available technology and market conditions have been considered. This represents a dramatic reduction in business-as-usual coal related methane emissions and a potential new revenue stream.

The opportunities exist for a rapid expansion of the industry fuelled by both technological advances and international scrutiny on GHG emissions. The Kyoto Protocol may further aid the flow of technologies from Annex I countries to non-Annex I countries via the clean development mechanism (CDM).

CBM developments improve the safety of mining, improve productivity within the mine, produce a revenue stream – and reduce emissions of a GHG that is 20 times more potent than carbon dioxide. CBM projects offer unique financial, operational and environmental benefits - an example of the coal industry turning a perceived problem into a realistic opportunity.

Most Annex I countries are now starting to introduce policies and measures that are limiting what otherwise would be the business-as-usual GHG emissions outcome – so impacts start to be felt, whether we like it or not. This could be related to future legally binding targets under the Kyoto Protocol. However, developed country Parties and other Parties included in Annex I have existing commitments to adopt policies and to take measures to limit anthropogenic emissions of GHGs with the aim of returning individually or jointly to their 1990 levels by the end of the present decade [Article 4 – Commitments paragraphs 2(a) and 2(b)].

Even without the Kyoto Protocol, a number of environmental initiatives are being implemented which could seriously constrain coal usage in a number of markets, such as the EU15 and the US. Renewables have political growth targets in a number of countries – and generous subsidy/support schemes to ensure achievement of these targets. Energy taxes are emerging in Europe as a broadly accepted component of environment policy. Italy has gone one step further and has introduced a carbon tax in the electricity sector - an uncompetitive tax approach and a bad outcome for coal. We will need to respond to these political issues. Any attempt to ignore these issues will only guarantee that coal will be ignored, to the detriment of our market share within the energy sector.

The coal industry must acknowledge these realities. We need to recognise that fossil fuels, including coal, have been clearly identified as leading culprits. This focus on GHGs means solutions are required to minimise potential impacts.

Negotiators accepted a Kyoto Protocol with significant - but un-quantified - economic implications for both developed and developing countries. Annex I countries need to assess their potential obligations under the Protocol, and the economic cost to their country.

The inclusion of legally binding targets on Annex I Parties will affect economic growth and (trade) competitiveness - and contribute to the transfer ("flight") of emissions, investment and jobs to countries where these restrictions or limits do not exist. How much affect this will have on the economy will depend on the mix of policies chosen by Parties to achieve their Kyoto target.

There is a need for a realistic set of policy measures at the international and/or regional level that provide both freedom and flexibility to enable Annex I Parties, who intend to ratify the Protocol, to implement cost-effective measures best suited to their economic circumstances and other national criteria and objectives. It is important that as few market and trade distortions as possible are created.

Within the Kyoto Protocol – and there is very genuine uncertainty over who will ratify and whether the Protocol will ever enter into force – there are a number of mechanisms that provide for flexibility in how individual ratifying parties may achieve their targets. If a country ratifies the Protocol, we believe they should have these mechanisms available to them to select a set of policies that minimise the cost of implementation.

While no single model should be taken as the mandatory blueprint, future negotiations should not exclude or limit access to emissions trading, the CDM, joint implementation (JI) and sinks.

These policy mechanisms would facilitate achieving the objective of the UNFCCC that "policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost" and the view of the WGIII to the IPCC Second Assessment Report that "Emission reductions should be carried out where it is cheapest to do so".

The suggestion by the EU15 to limit or cap the use of Kyoto mechanisms at the international level in meeting domestic targets is surprising. Achievement of its own target (the EU 'bubble') will only be managed in an efficient or cost-effective manner if the EU Member States have unrestricted access to the international Kyoto mechanisms - and access to emissions trading arrangements at both EU and member country levels. Or do the EU Member States see the cap imposing a higher cost on others and hence a trade advantage to themselves?

Policy measures should be comprehensive to ensure equity across all sectors. All sources and sinks of all GHGs should be addressed and arrangements should not concentrate on gases or emissions from selected sectors alone.

The emissions management system must also provide certainty for business and industry. Voluntary measures by industry and business can make a significant contribution. For example, in Japan the Keidanren has been the driving force behind the implementation of a national voluntary emissions reduction programme.

In some countries, voluntary agreements will face a reluctant industry/business participation level until policy provides greater certainty regarding treatment of emissions reductions under these programmes – and the early credits issue is resolved.

Given the legally-binding nature of the Kyoto targets, it is difficult to imagine that ratifying Annex I Parties will carry that risk without "downloading" this responsibility to emitters or to some classes of emitters, particularly large industry sectors. The method of management of industry targets - including allocation - becomes of critical importance.

Inclusion of clean coal technology projects under the Kyoto Protocol CDM would open the way for infrastructure projects by foreign countries/companies - and would increase the efficiency of the coal sector within non-Annex 1 Parties. For China and India (two of the world's top three coal consumers) this would mean more energy from each tonne of coal produced/consumed, less local pollution from coal combustion and foreign investors would receive emission credits for the reduction in emissions under the CDM.

Clean coal technologies have the potential to substantially reduce the level of CO_2 emissions per unit of energy output. For example, a conversion efficiency improvement in a coal-fired power plant from 20% to 30% brings a 33% reduction in CO_2 emissions (with 30% to 40% efficiency rates results in a 25% reduction in CO_2 emissions). (See Annex A.)

For example, improving the combustion efficiency of 5% of China's coal consumption (65Mt) from 25% to 35% would reduce emissions of CO_2 by 13.22 Mt-C for the same energy output; this is equivalent to 4.2% of Japan's CO_2 emissions. It is clear CDM projects in China could produce significant emissions reductions - and provide CDM credits for a country such as Japan if it decides to ratify the Kyoto Protocol.

The World Coal Institute encourages UNFCCC Parties to recognise the benefits from coal efficiency enhancement projects and to support coverage of such projects within the CDM under the Kyoto Protocol. This would improve both the environmental performance and energy efficiency of coal – particularly in China and India.

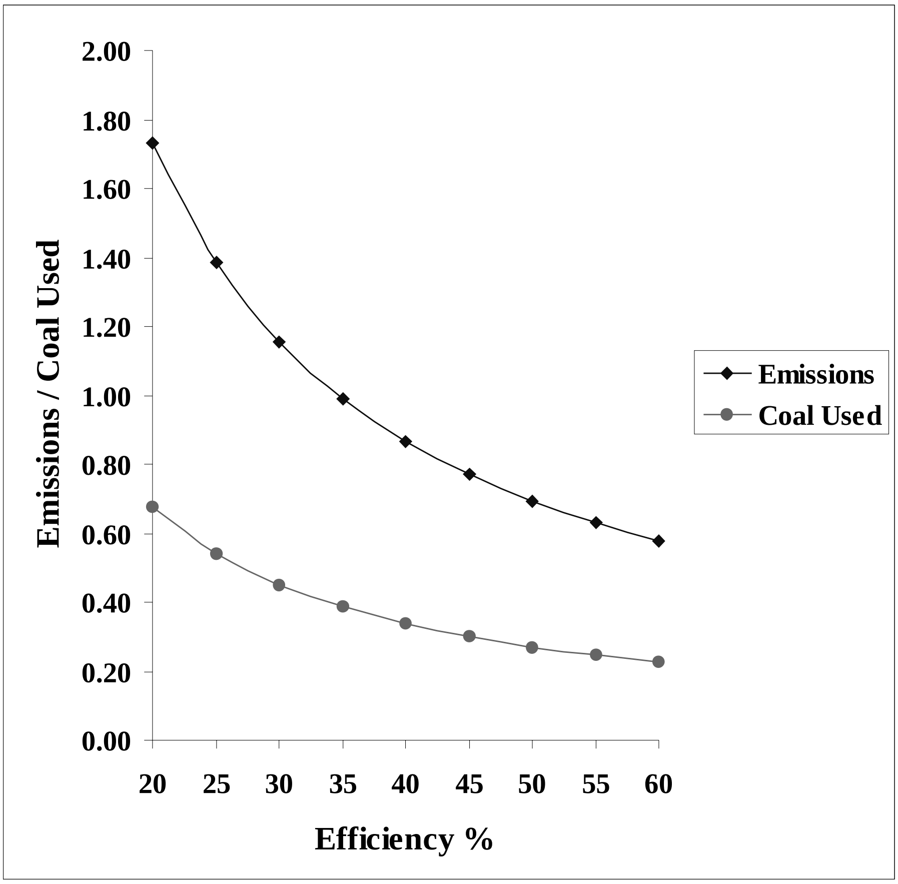
Some coal producers may seek to undertake CDM projects (or sinks) in their own country or in third countries to obtain credits for on-trading to customers in countries where there is a cap on sector/plant emissions; that is, selling coal with a carbon credit assigned to the trade.

For the coal industry, the Kyoto Protocol brings uncertainty. There will be higher global coal consumption in 2010 than current levels with a complex array of potential regional adjustments and outcomes. The actual impact on the market is impossible to predict prior to further development of the Kyoto Protocol details, ratification intentions of the main players – and the likelihood of entry into force.

The coal industry’s objective is to:

- maintain price competitiveness of coal;
- address methane emissions and energy efficiency at the mining stage;
- promote clean coal technology solutions to combustion efficiency;
- encourage voluntary agreements and cost-effective market solutions if Kyoto targets apply and, in particular;
- support inclusion of clean coal initiatives under the CDM;
- ensure access to emissions trading, CDM, JI and sinks is not restricted.

CO_2 Emissions per MWh of Electricity Produced from Coal at Various Levels of Efficiency



Efficiency %	**CO_2** Emissions	**Tonnes of** Coal Used
20	1.734	0.676
25	1.387	0.541
30	1.156	0.450
35	0.991	0.388
40	0.867	0.338
45	0.771	0.300
50	0.694	0.270

<u>Footnote:</u> Coal consumed / MWh = 1 / (efficiency x CV)

CO_2 emissions in t / MWh = 1 / efficiency x 44 / 12 x %C in fuel x 1 / CV

CV = 7.4 MWh / t of coal

Coal = 70% carbon

BIAC/OECD/IEA WORKSHOP ON CLIMATE CHANGE:

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ELECTRICITY INDUSTRY
Flexibility Mechanisms under the Kyoto Protocol

John Novak, Edison Electric Institute
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Common EEI/FEPC/UNIPEDE Position Paper for COP-4 (Buenos Aires)

1. Introduction

Electricity has a vital role to play in facilitating sustainable development and the electricity utility industry wishes to play a positive part in reducing greenhouse gas emissions in the most cost-effective manner.

Substantial reductions in GHG emissions represent challenging objectives for Europe, USA and Japan. The electricity utility industry considers the flexibility mechanisms (JI, CDM and emissions trading) introduced in the provisions of the Kyoto Protocol to be essential elements in reducing GHG emissions. The industry also recognises that much work has yet to be done to define the rules and modalities governing their implementation. We are willing to contribute to this work, drawing on our experience in AIJ. This will facilitate implementation of the flexibility mechanisms while ensuring associated business risks are minimised.

2. The role of electricity and electric technologies in support of the economy and the environment

The electricity sector provides a premium form of energy at competitive costs in a safe and secure manner. It acts responsibly in providing a wide range of services. Historically, the wider application and use of electricity has yielded substantial reductions in overall energy consumption, in the energy intensity of economic production and in energy-related carbon dioxide emissions and will continue to do so into the future.

On the supply side, electricity companies are limiting emissions from electricity generation, by improving efficiency and by increasing the use of non or low emitting supply technologies (hydro-electricity and other renewables, nuclear power, natural gas and advanced coal technologies). The extent of the role played by nuclear power in reducing greenhouse gas emissions, as recognized in the IPCC Report, cannot be ignored. For these reasons it is important to further improve the acceptability of nuclear power with respect to the perception of the issues of safety of nuclear plant and treatment of waste materials.

It is essential that emissions reduction, across sectors, can be met in a cost-effective manner. Electric technologies provide here good possibilities to reduce CO2 emissions because they can deliver, in a precise manner, amounts of energy exactly when and where needed.

On the demand side, the greater use of energy-efficient electric technologies is one of the most significant factors supporting economic growth, improving energy efficiency and reducing CO_2 emissions. This happens both by replacing less efficient electrical equipment with energy-efficient electric technologies, and by switching from fossil fuel end-use applications to more energy-efficient electric technologies.

Consequently, further electrification, based on an appropriate mix of primary energy, is a prerequisite for a global strategy to reduce greenhouse gas (GHG) emissions.

In October, IEA in collaboration with EEI, FEPC and UNIPEDE held a second Workshop on electric technologies in Paris. This Workshop, attended by many representatives of developing countries and economies in transition, discussed the reduction of CO_2 emissions through the efficient use of energy using electric technologies. It was recognized at the Workshop that electric technologies are highly effective in reducing CO_2 emissions in developing countries and economies in transition.

3. The views of the electricity industry on the Kyoto flexibility mechanisms

General Comments

There are a number of domestic policies and measures available to Governments to reduce GHG emissions. In addition to domestic programmes for meeting their own emissions targets, countries should also provide individual enterprises with full access to all the flexibility mechanisms contained in the Kyoto Protocol in a non distortionary manner.

The balance of measures adopted by any party will depend on a range of factors including its current level of economic development, economic growth rate, structure of the industrial base and geographic location. Means of reducing GHG emissions will differ from country to country but should constitute the most flexible, efficient and cost-effective means possible.

Diverse, secure and sustainable supplies of energy are required now and into the future in order to sustain competitive economies. It is therefore important that measures considered should contribute to the development of a competitive energy sector and that unsuitable measures such as taxes and/or subsidies and excessive regulation are not applied. Flexibility mechanisms, such as voluntary agreements and those introduced by the Kyoto Protocol, should therefore be used to pursue the goal of reducing emissions without introducing undue market distortions or interfering with the restructuring of the electricity industry globally.

The definition of the flexibility mechanisms introduced by the Kyoto Protocol should fulfill a wide set of criteria, including :

- equal access
- environmental benefits
- economic efficiency (no unnecessary bureaucracy)
- transparency and credibility (monitoring and reporting)
- adaptability to changes (e.g. new parties can join)
- feasibility (use existing institutions as much as possible)
- avoidance of new or additional market distortions

Determination of these criteria should include the following issues :

- Participation of private enterprise
  A system must be created that can be sustained into the long-term and an appropriate framework must be put into place for the participation of private enterprise.

- Creation of an active, healthy market
  A cost-effective market based on market mechanisms must be created.

- Encouragement of early action
  Until international agreement is reached on a framework for flexibility mechanisms, certification of reduced volumes of GHG emissions, the creation of a registration system, recognition of banking and other such forms of support should be given to early projects implemented by private enterprise, etc.
- Comprehensiveness
  All gases, sources and sinks should be considered.

Joint Implementation (JI) and the Clean Development Mechanism (CDM)

The AIJ (Activities Implemented Jointly) pilot phase of UNFCCC is due to end at December 31, 1999. Many electricity companies have been involved with AIJ projects and can therefore provide their experience in helping to define the rules of the JI and CDM mechanisms. In this regard, existing AIJ projects should be certified as JI/CDM projects if they satisfy the relevant criteria.

In order to be productive, the implementation of JI and CDM will need to function cost-effectively. In particular, transaction costs should be kept to a minimum in order that companies can find an interest in using these mechanisms.

It is essential that JI and CDM be set up under guidelines, modalities and rules (like baselines, inclusion of sinks, etc.) that are based on long-term, acceptable principles, and interpreted in the same way by all the Parties. COP-4 has a role to play in this regard.

Projects with commercial benefits should be accepted as JI/CDM projects if they can demonstrate additional greenhouse gas emissions reduction.

For CDM, the electricity utility industry welcomes the fact that certified emissions reduction units obtained from the year 2000 can be used and considers that early crediting could promote early progress towards sustainable development. For this reason, there is a need to develop the rules and modalities for the CDM on a faster track.

The electricity utility industry is willing to use these mechanisms to:

- promote electricity projects (generation, transmission and distribution), in particular in developing countries, as they can foster sustainable development,
- promote energy efficiency,
- elaborate also through partnerships between developed and developing countries, good practices for sustainable development.

Emissions trading

Trading can take place at a number of levels:

- within a national industry sector
- nationally across all sectors
- internationally

The electricity industry wishes to work in partnership with governments in helping to formulate the rules and mechanisms of emissions trading, in order to develop cost-effective and efficient trading systems.

International and domestic emissions trading systems should be compatible. In addition the international emission trading system should be capable of interfacing with electricity trading arrangements. Therefore the electricity sector wishes to be involved in the early definition of the implementation of the concept.

Different methodologies may need to be devised for different sectors. Any allocation should avoid market distortions and should recognize the overall benefits of a wider use of electricity.
Trading should be allowed at company level and the market be allowed to develop as freely as possible, while being transparent and credible.

There should be no obstacle to the incorporation of credits deriving from JI, CDM, and carbon sequestration in the emissions trading system.

Clear title to the emissions traded should be established.

Adequate notice of trading schemes should be made, so that companies are allowed enough time to make their choices.

The relationship between assigned amounts of Parties and emissions trading must be clarified.

4. Conclusions

EEI, FEPC and UNIPEDE consider that electricity has a vital role to play in sustainable development. On both supply and demand side diverse strategies can be utilised to help to reduce greenhouse gas emissions.

Measures that will be taken to reduce GHG emissions must be consistent with the competitive nature of energy markets and should not introduce market distortions. Flexible instruments, such as voluntary agreements and those introduced by the Kyoto Protocol, should be used, while unsuitable measures such as regulation, taxes and energy allocation, should be avoided.

The electricity utility industry notes that the flexibility mechanisms introduced as provisions in the Kyoto Protocol will have to be implemented in the right way and coherently in order to ensure full economic and environmental efficiency.

These flexibility mechanisms (JI, CDM and emissions trading) are viewed by the electricity sector as positive means for helping to promote sustainable energy development in economies in transition and developing countries and for lowering the cost of reducing GHG emissions. EEI, FEPC and UNIPEDE therefore recommend that the Parties define the modalities of their application in order that concrete projects might move forward. The electricity utility industry can offer its experience in helping to define these modalities.

The Edison Electric Institute (EEI), the Federation of Electric Power Companies of Japan (FEPC) and the International Union of Producers and Distributors of Electrical Energy (UNIPEDE), represent the electricity supply industry in most of the world's strongest economies and whose members are responsible for the majority of electricity generated throughout the world.

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RENEWABLE TECHNOLOGIES
The Basis for Sustainable Energy Production

Charles W. Lindermann, Edison Electric Institute
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The promise of renewable technologies is of a technologically rich and diverse selection of energy resources that leads towards global sustainability. Offering differing opportunities in each nation of the world, they require a fresh vision of electricity and energy supply and provide the opportunity to create new employment sectors as they are further utilized. Exponential growth is taking place in the wind and photovoltaic industries and more growth seems assured, not only in those sectors, but the balance of renewable technologies as well. Developing countries have unique opportunities to utilize renewables technologies which may seem unconventional to developed economies, but in fact are the practical application of locally available resources.

1. <u>A New Paradigm of Energy Service with Renewables</u>

Renewable technologies provide the developing world, particularly those countries with weak electric systems, the opportunity to leap-frog traditional electric infrastructure systems. For nations developing their electric systems, the opportunity exists with renewables to directly develop a «distributed» electric system using the variety of modular renewable technologies rather than developing a large «central» station approach to electrification. This change in electricity production is analogous to the way in which liberalized Eastern Europe has embraced the cell phone and other parts of Europe have embraced Direct-TV. The opportunity to by-pass the traditional hard-wired system presents an economic opportunity for developing countries that can afford them the advantages of electricity without the environmental issues associated with traditional means of electric supply. Electricity de France’s program with the French environmental agency ADEME in Africa of village electrification with «micro-grids» is one contemporary example of basic electrification using distributed systems.

Simultaneously, the increased utilization of renewable technologies in the developing world benefits the developed countries and OECD members as well. Many of these technologies costs are based on economies of mass production. Hence, as demand increases unit production costs are reduced benefiting not only the developing nations, but OECD economies where energy prices have felt the impacts of competition for many years. And some distributed renewable applications may allow industrial corporations to generate emissions credits directly on their own facilities to offset other production costs. Energy efficiency should be broadly defined so as to include direct applications of renewable technologies by end-users such as photovoltaic, solar thermal and in some cases, wind, biomass, or hydroelectricity.

Generally, the family of industries and technologies that make up renewables will benefit from the CDM, Joint Implementation as well as Emissions Trading. Some renewable technologies are ideally suited as CDM projects because of their benefits in the developing world. Many of the technology owners of renewables are large industrial or energy organizations who may choose to undertake CDM or emissions trading projects with the technology that is inside their corporate structure in order to create credits for use by other parts of the corporation.

2. Emissions Baselines Critical

One of the challenges to the deployment of non-emitting intermittent technologies is how to calculate the baselines for emissions credits or trading so that correct economic calculations can occur for the project investors to calculate ROI's and ROE's. The accounting and cash flow concerns, as well as legal issues in various countries around the world have an impact on project viability and whether or not appropriate trading mechanisms can be introduced. Emissions baselines are also important for biomass projects where agricultural plant residues and other wastes may be used in various combustion cycles or which may create methane for combustion in a small turbine.

For those who are interested in biomass projects, the development of various forestry projects and the ways in which various sink projects can work is most important. The forestry sinks, and the related impacts upon the development of forestry-related biomass projects are in need of greater attention from the international community.

3. Renewable Technology Characteristics

Each of the following technologies have opportunities to support a sustainable future both in electric production and in the construction of residential and commercial buildings:

- Wind
- Photovoltaics
- Biomass
- Geothermal
- Solar Thermal
- Hydroelectricity

Wind

The fastest growing source of energy worldwide with the potential to supply power to both the developed and developing world is wind. In Europe, the EU target of 12% energy from renewable sources appears as though it will include about 40GW of new electric capacity from large wind farms. The Australian renewable target creates opportunities for wind as well, particularly if an electric cable is built under the Bass Straits linking Tasmania to the rest of Australia. In the America's there are various opportunities for wind from repowering and new developments in the United States, to new projects in Argentina and Canada, and displacement of diesel in remote villages of Alaska. Some United States projects are now in the hundreds of megawatts.

Technologically, the wind industry is moving into a second generation of turbines and older machines are being replaced, especially in California. The new generation of turbines often produces electricity with variable speed machines that are able to convert greater levels of energy in the wind to electricity. Pilot projects in Europe have begun to demonstrate that land based technology is readily adaptable for marine conditions. Major offshore developments appear certain in the early part of the next century, and these have the potential for a dramatic increase in generation, especially in northern European waters. Some of the technology is similar to that used in the offshore oil and natural gas industries.

Integration of an intermittent technology, and the appropriate pricing mechanisms for transmission are in need of a system approach for wind to gain proper access to much of the market. Similarly, construction of new transmission lines, which are only used part of the time to move an intermittent resource to market will need some form of incentive in order for construction to proceed. The Danish utilities and wind operators have made substantial progress in being able to forecast generation based upon weather forecasts from the East Coast of Great Britain, allowing them to make off-system electric sales based upon the weather forecast.

Various wind turbine vendors offer products of different sizes that will be helpful in meeting the smaller load of developing countries and island nations. One of the challenges of operating smaller grids solely on wind is the backup source of electric production if the wind system is being used for basic electricification. Various hybrid applications have been developed including with photovoltaic and diesel generator sets so as to provide consistent reliability. Maintenance can also become an issue where small numbers of turbines are deployed. Training of staff for maintenance purposes is important in remote applications.

Photovoltaics

The direct conversion of sunlight to electricity offers growing promise throughout the world for countless applications. In use today from the equator to both polar regions, it can be used for basic electrification or to augment the existing grid. While annual worldwide production remains under 200MW, many of the owners of photovoltaic production facilities are major multinational conglomerates or multinational energy corporations. The investment by major multinational corporations in photovoltaics is virtually unique among the renewable technologies.

The key barrier to wider applications of photovoltaic is the high cost of the technology for many applications --- but that does not mean that there are not cost-effective applications even in developed countries that are OECD members. Water pumping, lighting, refrigeration and electric load reduction all fit in cost-effective applications at the present time. Easy to use and install consumer products are also essential in photovoltaic efforts to supply a larger share of energy needs.

The IEA’s Photovoltaic Power Systems Implementing Agreement produces twice yearly newsletters that address the current applications of photovoltaics worldwide and biannually produce a report on the status of photovoltics in OECD member countries and breaks down the applications in great detail.

At the present time in Europe, Japan and the United States there is great interest in the integration of photovoltaics into both residential and commercial construction. New products are being brought to the market, including those for hotel design to assist in the development of «eco-tourism». Home builders in North America are beginning to incorporate photovoltaics into their options for residential construction, appealing to a green market, while commercial real estate developers, including one on Times Square in New York City are incorporating photvovoltaics into the construction of a new office tower more than 40-stories tall. Photovoltaics has public support and as the electric industry moves to greater levels of customer choice, more widespread use of photovoltaics is likely.

Biomass

The potential to meet energy needs through biomass is enormous and can occur with small technologies distributed in village size applications, to the co-firing of wood wastes in large coal-fired boilers as a means of reducing emissions. Some applications will be unique to certain parts of the world ---- gasification processes, such as one in Burlington, Vermont; gasification of alfalfa stock in Minnesota after the leaves are made into pellets for agricultural foods; and the use of various kinds of digestors to convert animal wastes into methane for use in small distributed electric generation units.

Currently, it appears that biomass may have more widespread applications in some parts of the developing world that are also tropical where significant amounts of wastes are produced. Gasification of straw provides opportunities for electrification and the elimination of a significant waste stream as well. Business interests in Southeast Asia are promoting CDM projects using methane produced from sewage treatment plants in major metropolitan regions.

New crops are under development to provide the enormous quantities of biomass necessary to impact changes in the electric systems of OECD members. For example, US researchers are developing fast growing tree species to supply greater levels of wood production in the US and there are experiments underway with various other herbaceous crops across North America to aid electric generators in using more biomass. Economics and development of the fuel supply chain will be important to these technologies in whatever part of the world they are applied. The fundamental challenge is to look beyond energy or electricity production and find the synergies in each local community.

Hydroelectricity

Certainly the largest renewable in much of the world is hydroelectricity; however, it faces a challenging future. In both the United States and Canada there are assaults from various environmental forces upon the continued use of hydroelectricity, and US regulators have ordered that two small dams be torn down in the name of restoring anadromous fish habitat. Canadian interests seeking to expand large hydroelectric systems in the Hudson's Bay Region face environmental opposition on several fronts. Even the assumption that hydroelectricity is a «renewable» is the source of debate. Advocates who would change the hydroelectric system have not recognized the impact upon CO_2 emissions if zero emitting hydroelectric systems are forced to make significant changes to their operations which results in the substitution of fossil fuels. As the time nears that large dams need replacement or relicensing, existing owners will need to make a sophisticated case for their continued use as a means of minimizing environmental impact of electric production.

The development of «micro-hydro» or small scale systems, which may be very small by traditional standards, offers new opportunities to make use of a natural resource without the environmental impact associated with traditional systems. In developing countries in need of electrification, it may be applicable or it may be more technology and infrastructure than the country is ready to use. As in the case of all renewables the applications need be thoroughly understood on a local basis.

Geothermal

There is the potential for greater use of geothermal resources around the globe. The steam resource at the Geyser's in California has proven to be a reliable, baseload source of energy for electric production. Hot water systems in other parts of the world have made for effective space heating systems. Better resource characterization and improved conversion technologies provide opportunities to use the natural heat of the earth in various applications. Some emissions control can be necessary depending upon the natural constituents of the resource.

Solar Thermal

Solar thermal systems which produce hot water for residential and commercial use are well established in a variety of economies throughout the world. Lower first-costs would make applications more widespread, however.

Hot water systems, that create sufficient heat to make steam and turn a steam turbine for electric production are still in the developmental stage. The US has tried two different technologies with a central solar receiver, and while promising, the economics need further refining. Parabolic trough systems have special niche applications and need carefully understood economics and weather conditions to be effective.

4. Conclusions

Renewable technologies offer opportunities for the creation of new product lines for energy companies. These technologies can benefit from the flexibility mechanisms of the Kyoto Protocol if the developing nations are willing to participate. Renewables have the potential to put the developing countries on a path to sustainable energy supply at the same time that increased production of renewables lowers costs, and then provides opportunities for more cost-effective applications in the OECD.

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VIEWS OF AMERICAN AGRICULTURE ON THE CLIMATE CHANGE TREATY

Jon Doggett, American Farm Bureau

1. The Industry

1.1 Who is the Industry?
1.2 What products do you produce?

The United States is the world's largest agricultural producer, producing over 300 crops with receipts exceeding $200,000 billion. This production comes primarily from operations owned and operated by families. There are nearly one million farms in the United States. Food and fiber accounts for 20 percent of U.S. gross domestic product.

U.S. agriculture is very dependent on exports. One half of the wheat produced in the U.S. is destined for export markets. Thirty percent of feed grains and cotton are shipped abroad. Over 40 percent of the U.S. soybean crop is exported. Overall, one out of every three acres of America's farms is dedicated to exports.

Over 12 million American jobs now depend on agricultural exports, including one in five manufacturing jobs. One out of every six new jobs created in the last 5 years is because of exports. And that in turn means higher living standards, as jobs supported by exports pay an average of 13 to 16 percent higher than the U.S. national average.

1.4 What does your Industry intend to do to contribute to the Kyoto targets?

American agriculture's greatest contribution to the Kyoto targets would be to continue to expand farming practices that some experts feel sequester greenhouse gases. However, if the Kyoto Protocol implementation causes U.S. agriculture to lose export opportunities, much of the acreage now sequestering greenhouse gases would be lost to production and could be developed for non-agricultural uses.

1.5 What are the implications and have you analyzed the cost of reducing emissions to the Kyoto target?

Analysis developed by Standard & Poor's Data Resource International (DRI) shows that implementation of the Kyoto Protocol, without significant change, would, by 2010, result in the following:

Fewer small family farms. Higher energy costs, together with the reduced domestic and export demand could lead to a severe decline in agricultural investment, and a sharp increase in farm consolidations. Implementation of the Kyoto Protocol would greatly accelerate the reduction in the number of small farms operated by families.

Higher production costs. Production costs could increase by up to $16.2 billion (8.8%) and would be difficult for agriculture to pass on to consumers. These higher production costs include a $13 billion increase in manufactured input (fuel, fertilizer, and chemicals) expenditures, a $1.6 billion increase in farm origin (feed, livestock, and seed) inputs, and a $1.9 billion increase in general operating expenses.

Lower demand for agricultural products. Weaker demand for agricultural products results both from the 1.6% decline in GDP and 2.4% decrease in consumers' disposable income. U.S. farmers and ranchers would be forced to compete with producers in developing countries who do not face emission constraints. These changes could reduce sales by $5 billion at the farm level.

Reduced farm income. As a result of reduced agricultural revenues and increased production costs, net farm income could be reduced $21.5 billion from 1998 levels to $24 billion – more than a 50 percent decline.

Increased marketing costs. Costs of processing, storing, transporting and handling commodities and food products would increase. The wider marketing spreads could boost consumers' food expenditures nearly $18 billion.

Higher food costs. The increase in food marketing costs would be small for the average U.S. consumer who spends 11.9 percent of disposable income on food. However, 37% of U.S. households have less than $20,000 in after-tax income and spend from 21.2 per cent to more than 100 percent of their after-tax income on food. In these families, infants and children would experience the greatest impact to their diets.

Higher food program costs. For example, the United States Department of Agriculture spends more than $39 billion for six food assistance programs, including the Food Stamp and Child Nutrition Programs. For these programs alone, emission controls from the Kyoto Protocol could add 500,000 persons to Food Stamp rolls and increase costs up to 5 percent annually.

Additional studies confirm the clear possibility that implementation of the Kyoto Protocol, in current form, would have a devastating effect on U.S. agriculture.

The clearest implication for U.S. agriculture under the Kyoto Protocol would be the loss of competitiveness to non-signatory nations producing for the world market.

1.6 Assume your industry must meet the Kyoto target ... how will it do it? What policies are needed that are cost-effective?

Given the projected costs, there appears little opportunity that U.S. agriculture, in its current construct, could bear the costs of implementing the Kyoto Protocol. Implementation would force many small family operations out of business.

If trading in carbon sequestration credits were to be allowed under the Kyoto Protocol for crops other than trees, and an efficient free market trading system were in place, there could be opportunities that would provide for the capital and revenue necessary to further reduce greenhouse emissions.

1.7 What are your views on "policy packages", e.g., voluntary/negotiated agreements, emissions trading, JI? Do you have any recommandations?

Emissions trading, if allowed for non-forest cropping, could greatly expand U.S. agriculture's potential to further sequester greenhouse emissions and to reduce emissions from production that produces emissions.

3. <u>Flexible Mechanisms (General)</u>

3.1 Can each company in your Industry verify its 1990 baseline? On an Industry basis?

Very few, if any, individual farming operations could verify its 1990 baseline. It would be difficult to verify the industry's 1990 baseline.
Many U.S. farm producers are concerned with the lack of ability to verify 1990 baselines. Additionally, some producers are reluctant to pursue efforts to reduce emissions or enhance sequestration activities without knowing if these activities will be accurately measured and credited.

3.4 How important are flexible mechanisms in stabilizing atmospheric concentrations of GHG's compared to other policy instruments?

No policy vehicle will provide for stabilization of atmospheric concentrations of GHG's unless all nations participate.

7. Carbon Sinks/Sequestration

7.1 Does your Industry support development and or protection of carbon sinks as a policy option? Why or why not?

U.S. agriculture could support development of carbon sinks as a policy option if the program was voluntary in nature and supported by an active free market trading mechanism.

Conclusion

Underlying this entire policy debate is the challenge that there is human-induced global warming of significant consequence. More than 17,000 scientists recently signed a petition calling for focus on research on this issue. They stated, "There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the earth's atmosphere and disruption of the earth's climate,". Clearly, U.S. agriculture is very concerned that American farmers and ranchers would face serious economic hardship if the Kyoto Protocol is implemented in light of creditable scientific questioning of the need for such drastic measures. Additionally, U.S. agriculture objects to the call for reduction of carbon emissions for signatory nations when the majority of emissions do, or soon will, come from nations not willing to participate in such implementations. If the goal of implementation is to reduce greenhouse emissions, then the Kyoto Protocol falls far short of its goal.

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PAPER AND FOREST PRODUCTS INDUSTRY VIEW

Allen M. Koleff, V.P., Smurfit-Stone Container Corporation

1. The Industry

1.1 Who is the industry?

The U.S. Forest Products Industry ranges from state-of-the-art paper mills to small family-owned sawmills and some 7 million individual wood lot owners. As a whole, the U.S. industry directly employs about 1.6 million people. Most of these positions are high quality manufacturing positions paying an average salary for non-supervisory workers about 50% higher than the average salary for all industries. Indirect employment accounts for another 2.7 million jobs. It produces wood and paper products valued at more than $230 billion a year. In 1997, pulp and paper exports were valued at $13.5 billion, which represents two percent of total U.S. merchandise exports.

1.2 What products do you produce?

Industry members grow, harvest and process wood and wood fiber; manufacture pulp, paper and paperboard products from both virgin and recovered fiber, and produce solid wood products.

1.3 What share of the GHG emissions do you produce in OECD and non-OECD?

In 1995, the latest year for which information is available, the U.S. Forest Products Industry emitted 117 million metric tonnes of carbon dioxide. It is interesting to note that, of that total, approximately 9.8 million tonnes, about 8 percent, were attributable to use of technologies necessary to comply with current and anticipated U.S. environmental regulations. The U.S. Forest Products Industry's emissions represent only 3% of total U.S. emissions of carbon Dioxide.

1.4 What does your industry intend to do to contribute to the Kyoto targets?

The U.S. Forest Products Industry intends to continue to improve its already exemplary record of energy efficiency by implementing available technology within its natural capital cycle.

1.5 What are the implications and have you analyzed the cost of reducing emissions to the Kyoto target?

The U.S. Industry is in the process of completing a peer reviewed estimate of costs that would be associated with meeting the Kyoto emissions reductions caps and targets. Preliminary data suggest that the costs would be the largest single environmental regulatory cost ever imposed on the industry. Even without a final estimate, however, the U.S. industry anticipates the timetables and targets in the protocol will have negative consequences on its future health. First, the failure to include developing countries will put the industry at a significant competitive disadvantage. Second, because the artificial timetables in the protocol penalize industries that already are energy efficient, it is likely the U.S. Forest Industry would have to implement a program that is not cost-effective. Finally, the unrealistic timetables in the protocol further disadvantage industries, like the pulp and paper segments of the U.S. Forest Industry, which are capital intensive and which have lengthy capital investment cycles.

1.6 Assume your industry must meet the Kyoto target ... how will it do it? What policies are needed that are cost-effective?

The U.S. Forest Products Industry does not believe the emissions reductions and timetable contained in the Kyoto Protocol will permit the development of cost-effective policies to assist industries in meeting the targets. There are, however, several actions that can be taken that, to a small degree, may ameliorate Kyoto's negative impacts: (1) meaningful participation by industries from developing countries must be obtained; (2) interpretations of the Kyoto Protocol must be made to maximize the benefits of carbon sequestration, i.e., managed forests, including plantations, should qualify as sinks and be included under the Clean Development Mechanism, carbon sinks must include the carbon stock growth from the 1990 baseline, and credits should be available for carbon stored in wood products; (3) a system to award credit for early action must be created; (4) worldwide emissions and carbon sink trading, without caps, must be available to all countries; and (5) use of biomass fuel must be recognized as a net-zero contributor to greenhouse gas emissions.

2. Voluntary or negotiated agreements to reduce CHG emissions, in particular energy efficiency

2.1 What experience and history does your industry have with energy efficiency improvements and voluntary or negotiated agreements?

The U.S. Forest Products Industry has an exemplary record of energy conservation. Data covering 1972-1995 for instance, show that the pulp and paper segment of the industry:

- increased use of self-generated and biomass sources of energy from 40 percent of total energy used in 1972 to 56 percent in 1995 (wood products manufacturing currently derives 74 percent of its energy requirements from biomass);*

- reduced total oil consumption by 68 percent;

- reduced total consumption of fossil fuels and purchased energy by about 9.1 percent; and

- reduced average use of fossil fuels and purchased energy per ton of output from 19.1 million BTUs in 1972 to 11.0 million BTUs in 1995.

This record of accomplishment is all the more remarkable because the steps taken to achieve these significant increases in self-generated and biomass sources of energy and decreases in the use of fossil fuels took place even as the industry was increasing production by 67 percent in the 1972-1995 time period.

Furthermore, the U.S. Forest Products Industry cogenerates over 60% of all the electricity it consumes. This cogeneration of electricity results in a saving of over 5 million metric tonnes of carbon annually.

2.2 What are the barriers to energy efficiency improvement and successful use of energy efficiency agreements?

The U.S. Forest Industry views the unrealistic timetables in the Kyoto Protocol as a primary barrier to cost-effective energy efficiency improvement. The Industry's record of improved energy efficiency clearly demonstrates its ability to develop and implement new technology within its natural capital cycle. Most recently, the industry, in cooperation with the U.S. Department of Energy launched a joint effort to assure that this technology evolution is sustainable. Projects of specific interest to efforts to reduce emissions of carbon dioxide are designed to increase the efficiency of energy recovery in the recycling and reuse of black liquor, a byproduct of the industry's pulp manufacturing process, and other biomass fuels as replacements for carbon dioxide-generating fossil fuels. To date, however, the technology is not commercially demonstrated and, when and if it is, it will require very substantial sums of capital and a long time to install.

* The U.S. Forest Products Industry is, in fact, the world leader in the use of renewable biomass energy.

The Industry is concerned that Kyoto's artificial deadlines for emissions reductions contained in the Protocol will lead it down one of two equally undesirable paths: either being forced to adopt other existing, less-efficient and more expensive technologies or the mandating of the installation of new technology in a way that disrupts the normal capital investment cycle of the industry, and ignores the long development time for new technology. The industry's capital investment cycle has been estimated at 30 years and the development time for energy related technology improvements can be easily 15 years or longer. If either scenario plays out, it will have serious consequences to the continued viability of the industry.

3. Flexible Mechanisms (General)

3.1 Can each company in your industry verify its 1990 baseline? On an industry basis?

It is likely that a credible accounting of baseline emissions for the U.S. Forest Products Industry 1990 total and most individual companies can be made.

4. Credit for early action

4.1 Does your industry support early credit? Why or why not? In what form?

The U.S. Forest Products Industry supports credit for early action because, if the provisions of the Kyoto Protocol are mandated, it is imperative that sources, particularly those with lengthy capital investment cycles, be afforded the opportunity to spread the necessary costs over the longest period possible.

5. CDM

5.1 Will your industry do CDM projects because of the need to receive carbon credits or will they do them for other reasons?

Since Kyoto would put the manufacturing side of the U.S. Forest Products Industry at a severe competitive advantage vis-a-vis its competitors in developing countries, it is highly unlikely that U.S. companies would compound this situation by giving technologies to these countries in order to gain carbon credits.

5.2 Will CDM projects be cost-effective for your industry?

No. Because of the industry's capital intensive nature, it is unlikely that CDM projects could effectively compete for capital required for process and product improvements to satisfy changing customer requirements.

6. Joint Implementation

6.1 Does your industry have any experience having done JI projects? Why or why not?

At this juncture, the Industry does not have experience with JI projects, primarily because the issue is so new and no system for providing credit for early action is in place.

6.2 Will your industry do JI projects with Kyoto ratification? Why or why not?

It is likely that the Industry or its individual members will participate in JI projects.

7. Carbon sinks/sequestration

7.1 Does your industry support development and/or protection of carbon sinks as a policy option? Why or why not?

The U.S. Forest Products Industry strongly supports carbon sequestration as one means of compliance if the Kyoto Protocol must be implemented. Carbon sequestration provides the most cost-effective means available to reduce greenhouse gas emissions by offsetting them.

7.2 What are the barriers for use of carbon sinks by your industry?

The U.S. Forest Products Industry is in a unique position because its primary business depends upon tree planting and forest management. Thus, it is from a credible base of expertise that the Industry has concluded that the many carbon sink concepts, terms, dates, and unresolved issues in the Protocol that represent the most significant barriers to use of carbon sinks by the Industry.

Together with the other members of the International Forest Industry Roundtable (IFIR), whose members also include Australia, Brazil, Canada, Chile, Finland, New Zealand, Norway, and South Africa, the U.S. Forest Products Industry has identified the following seven key carbon sink policy issues, terms and concepts for adoption by the UNFCCC Conference of the Parties.

- Reforestation, Afforestation and Avoidance of Deforestation (RAD) are distinct activities that must be separately defined. We recommend using the accepted definitions of the Food and Agriculture Organization (FAO)/International Union of Forest Research Organizations (IUFRO). These individual activities must be eligible as a carbon sink credit action.

- The Protocol adopts the "carbon stocks" approach to estimating and establishing levels of carbon stock in 1990. This was reinforced by the Subsidiary Body for Scientific and Technological Advice (SBSTA) Land-Use Change and Forestry Contact (LUCF) Group statement at the UNFCC Bonn meetings. The Protocol and SBSTA direct nations to use a carbon stock method, which the participants of the IFIR fully support.

- The June 11 SBSTA/LUCF Contact Group Statement from Bonn provides no sequestration credits between 1990-2007. The IFIR opposes this interpretation. Article 3.3 provides that net changes in emissions are to be "measured as verifiable changes in carbon stocks in each commitment period." Given that the targeted commitments and reductions in emissions are measured against a 1990 baseline, the change in carbon stock should be calculated as the average stock in the 2008-2012 period minus the carbon stock in 1990.

- The concept of "direct human-induced land use change and forestry activities" must be expanded beyond the restrictive interpretation as defined by the "Kyoto Forest," i.e., forest stands established on land after 1990 that were not in previous forest cover--less than one percent of the world's forests. It should include areas subject to forest management activities and measured through changes in carbon stocks including to those forest stands established prior to 1990. Exclusive of this definition are all land use changes associated with acts of war and god.

- The long-term storage of carbon in forest products, soils and other stocks must be recognized as an additional human-induced activity.

- International verification requirements for carbon sinks can be satisfied through transparent inventory and reporting requirements of each nation:

  -- Countries that routinely collect forest biomass and inventory data can determine relatively precise and direct measurements of the changes in their biomass stocks.

  -- For countries with less sophisticated programs and measures, the IPCC Guidelines outline procedures to obtain forest carbon sink data.

- In the eventuality that flexible mechanisms are implemented, and to clarify the application of the "assigned amount" to the parties, it is necessary that the rights to the carbon be clearly defined and that the benefits of investment in sequestration are assigned accordingly.

7.3 Should this area be a higher priority by the international community?

Yes. It probably offers the greatest potential for alleviating some of the devastating impacts implementation of the Kyoto Protocol would have on the U.S. Forest Products Industry.

8. <u>Emissions trading</u>

8.1 Do you support emissions trading? Why or why not?

The U.S. Forest Products Industry supports an emission trading program that allows individual company participation to be voluntary, and which is flexible and cost-effective. Such voluntary participation in a program providing a cap on emissions would provide the industry with a means to offset some of the severe economic affects it would suffer if the Kyoto Protocol were to be implemented. In addition, such a program must:

- recognize that combustion of biomass fuels does not contribute additional greenhouse gas emissions to the biosphere and such emissions should be exempted from a trading program;

- provide an appropriate emission reduction credit for any new substitution of biomass fuels for fossil fuels; and

- provide tradable credits for carbon storage that takes place in managed forests and manufactured wood and paper products.

- guarantee that sources which decrease emissions before 2008 are given credit for such early reductions and provide that these early credits are tradable.

BIAC/OECD/IEA WORKSHOP ON CLIMATE CHANGE:

INDUSTRY VIEW ON THE CLIMATE CHANGE CHALLENGE WITH SPECIAL EMPHASIS ON THE KYOTO MECHANISMS

STEEL INDUSTRY

Charles G. Carson, U.S. Steel Group
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1. The Iron and Steel Industry

Crude steel is produced by refining iron ore or by the remelting of iron and steel scrap. The former process, generally referred to as integrated steelmaking, reduces iron ore to iron by reaction with coke in a blast furnace, and subsequently refines the iron to steel in an oxygen furnace. The latter process, generally referred to as electric furnace steelmaking, remelts scrap (or other sources of iron) in an electric arc furnace. The subsequent processing of the steel to finished product is similar for the two processes. About two-thirds of the world's steel is produced by integrated plants, although nearly all the incremental capacity constructed in OECD and non-OECD countries over the past decade has been electric-furnace based.

Salient data[*] concerning the industry include the following:

- 1997 world production of crude steel was 793 million metric tonnes.
- Of the 793 million tonnes, 412 million (52 percent) were produced in OECD countries.
- World steel consumption has grown during the period 1993 through 1997 from 624 to 695 million tonnes, with per capita consumption increasing in all areas but the former USSR and Africa.
- 80 percent of world steel production is continuously cast, a process which achieves considerable savings in energy and product yield compared with ingot casting.
- Sources of iron for steelmaking in 1996 include iron ore (1,009 million tonnes), scrap (296 million tonnes), and direct-reduced iron (36 million tonnes); these raw materials, along with coke (carbonized coal) are produced and traded worldwide.

2. Greenhouse Gas Emissions[**]

Carbon dioxide is produced during iron and steelmaking, either directly from the process (e.g., the reaction of carbon [coke] with iron oxide in the blast furnace) or from a power plant producing electricity. In the steelmaking process, carbon is a necessary chemical feedstock to reduce iron oxide to iron and is an additive which is used to strengthen steel. Emissions of the other greenhouse gases during steelmaking are inconsequential.

- Energy consumption for integrated steelmaking is about 23.2 GJ/tonne and about 10.5 GJ/tonne for electric furnace steelmaking. With a ratio of 60 percent integrated production/40 percent electric furnace production typical of the USA and EU, the sector energy intensity is about 18.5 GJ/tonne.
- Carbon dioxide intensity of integrated steelmaking is 1.6 tCO_2/tonne (0.44 tC/tonne) of crude steel, whereas for electric furnace steelmaking it is 0.7 tCO_2/tonne (0.19 tC/tonne) of crude steel, yielding a sector intensity of 1.25 tCO_2/tonne (0.34 tC/tonne) crude steel.

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[*] "World Steel in Figures," International Iron and Steel Institute, Brussels, 1998.
[**] Energy and emission factors taken from unpublished U.S. EPA study, 1999.

- Total CO_2 emissions from steelmaking are estimated to be 125 Mt (34.4 MtC) in the USA and 200 Mt (54.5 MtC) in the EU, representing about 2 percent of total USA emissions of CO_2 and 6 percent of EU emissions.

- Iron and steel production accounts for approximately 4.5 percent of global CO_2 emissions; slightly more than half (2.4 percent) is attributable to OECD countries.

- These data are gathered from a variety of sources. Their accuracy is open to question. Efforts are underway by the industry in a number of countries to improve the quality of the data with regard to issues of completeness and accuracy. This will remain a major issue with regard to the establishment of baseline performance for 1990.

3. Efforts to Reduce Energy Usage

The cost of energy is a significant proportion (e.g., 15 percent) of the total cost of making steel. Therefore, the reduction of energy has been of major concern to steelmakers, and significant progress has been made over the past two decades.

- For the EU specific energy consumption has declined 40 percent since 1960.

- For the USA a 45 percent reduction has been achieved since 1975.

These reductions have been achieved by significant capital investment in more energy-efficient technology (e.g., electric arc furnace steelmaking, continuous casting, continuous processing) and modification to existing technologies (e.g., coal injection in blast furnaces, increased consumption of by-product gases having fuel content, using waste heat to run co-generation plants). These voluntary actions have all been taken as a result of market signals, in contrast to government mandate, to insure the long-term competitiveness of the industry.

In the context of the Kyoto commitments, governments are taking steps to encourage industry to further reduce the use of energy. The American Iron & Steel Institute and the U.S. Department of Energy have identified a number of energy-saving technologies available now or within the near term. Various EU countries are developing energy efficiency agreements that will allow industry significant flexibility in reaching clear, realistic, mutually acceptable goals. For example, Germany is seeking a 20 percent improvement in energy efficiency for the period 1990 to 2005; Finland, 8 to 15 percent; and the Netherlands, 20 percent for 1989 to 2000. The steel community is actively involved in these and similar programs worldwide.

The international steel community sponsors numerous research programs to develop new technologies that produce steel with vastly reduced CO_2 emissions. Some programs will take 30 to 50 years and significant funding to bring to fruition with no guarantee of success. It should also be recognized that steelmaking is a highly capital-intensive industry with a long investment cycle (e.g., a coke battery may be useful for 40 years; a blast furnace, steel shop or rolling mill for decades with normal maintenance and upgrades). Worldwide it is also a low-margin business that has difficulties in attracting investment capital in many parts of the world. Recognizing the importance of steel to the global infrastructure, governments should not impose unreasonable demands on an industry which has demonstrated progress towards reduction in CO_2 emissions, rather policies should emphasize flexibility, incentives (e.g., in the form of investment tax credits), realistic time frames, and allow for industry growth. These are often referred to as "no-regrets" policies.

4. Voluntary Agreements, CDM, JI, Emissions Trading, Credit for Early Action

- Voluntary agreements. U.S. and Canadian steel companies have participated in a variety of voluntary (national) programs that encourage energy efficiency, and have met and exceeded the program goals in a cost-efficient manner. These programs, in which the participants agree (but are not required) to meet certain goals, have generally been sponsored by the U.S. Environmental Protection Agency.

The U.S. Department of Energy has also sponsored a variety of programs that sponsor research in new energy-efficiency technologies. These programs pool the research funds of participants with matching government funds to underwrite long-term research programs.

The Clinton Administration has proposed a $4 billion program of spending and tax incentives to spur the development of more energy-efficient vehicles, homes, and heating and cooling equipment. The industry will take advantage of this program if it becomes law.

- Flexible instruments. To our knowledge there has been no action by a steel company under the clean-development mechanism or joint-implementation provision of the Kyoto Protocol. There has been some interest in programs involving carbon sequestration and/or carbon trading.

  Our basic position on flexible instruments include the following:

  (1) CDM/JI projects can encourage economic growth and development.
  (2) CDM/JI projects must be structured to provide real benefits to all partners.
  (3) CDM/JI projects must be cost effective.
  (4) Financing will be a problem; international institutions (EBRD, World Bank, IMF) must support these projects.
  (5) Pilot projects are necessary and should be encouraged to provide a basis for subsequent development of international standards for CDM/JI projects.
  (6) Any bureaucracy developed to administer CDM/JI projects should be charged with encouraging these programs, not burdening them with unnecessary regulation.

  Flexible instruments, developed and utilized wisely, have the real potential for aiding the growth of developing countries in an environmentally protective way, while reducing the global emission of greenhouse gases without placing an undue burden on the economies of the Annex I countries.

  (We believe that more research is necessary to identify opportunities beyond forestation for carbon sequestration, e.g., chemically capturing the CO_2 emissions, the proposed use of iron fines spread over large areas of sea surface, etc.; this would seem to be an ideal area for major international research sponsorship.)

- Emission trading. The steel industry has little direct experience with emission trading. The trading of SO_2 (a cap-and-trade model) in the USA has not involved the steel industry; the proposed trading of NOx may involve steel in the future. We are aware of state programs in the USA that trade VOC's through a baseline-and-credit program. Comparing the cap-and-trade and baseline-and-credit models, we find the latter is more resource-intensive, involves high transaction costs, and requires a more strict regulatory regime. Our experience suggests that a cap-and-trade model may be most user-friendly, so long as there is an open market, credits are guaranteed by the seller, baseline performance is measurable and verifiable, and the program is broad and enforceable. It is clear that pilot studies must be run to identify the best trading system, to develop protocols to define a credit, and resolve major issues of compliance and enforcement. Certainly the breadth and extent of the steel industry around the world would facilitate its participation in trading programs.

- Credit for early action. It is essential that there be full credit for any early action. It is unreasonable to ask industry to devote the resources to a CDM, JI, or trading program under an amorphous set of rules or without some assurance that there will be a "return" on its investment. (We distinguish here between programs that have a viable business basis with an incidental outcome of reducing GHG, and programs or investments made specifically to reduce GHG; the latter programs may be very desirable, but have economic value only if full credit for the action is obtained.) Having a clear legal foundation for early-action credits is essential if early action is to be encouraged.

Econometric modeling suggests that voluntary programs would provide lower cost routes to GHG reductions. The alternatives include undesirable instruments such as carbon taxes. The impact of a carbon tax has been modeled for the steel industry by the U.S. Department of Energy.* For a 2010 to 2015 time frame, the carbon tax assumed in the study would approximately double the energy costs for the industry (slightly more for integrated plants, slightly less for electric furnace plants) increasing manufacturing costs $25 to $75/tonne. This could be partially overcome by new technologies, but the potential energy savings are only in the order of 10 to 15 percent. The effective result of such a tax would be to render the steel industry (in most OECD countries) non-competitive with countries not imposing such a tax. This would effectively shift steel production and CO_2 emissions to these low-cost areas. The desired total decrease in CO_2 emissions would not occur. This outcome clearly argues for global participation in GHG reduction efforts to minimize emission migration.

In our perspective, the Kyoto Protocol requires too great a reduction in GHG emissions in too short a time. The urgency of the Protocol is not supported by current scientific understanding. It does not provide the orderly development of the international implementation mechanisms it proposes.

The protocol established unrealistic targets, that will have to be chased at unreasonable expense and potential economic hardship. In that respect, the support of the citizens of the Annex I countries is essential; if this support waivers, our ability to achieve necessary long-term reduction in GHG concentrations may be compromised.

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* R. J. Sutherland, et al., "The Impact of High Energy Price Scenarios on Energy-Intensive Sectors: Perspective from Industry Workshops," Argonne National Laboratory, U.S. Department of Energy, July 1997.

BIAC/OECD/IEA WORKSHOP ON CLIMATE CHANGE:

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A PROFILE OF THE GLOBAL ALUMINIUM INDUSTRY

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1. Introduction

This document presents the common views of a group of aluminium producing companies from OECD countries as debated in an International Primary Aluminium Institute (IPAI) meeting held in Paris, January 19-20, 1999. On some topics, and often in relation to some specific national contexts, some companies or some national or regional associations have developed more detailed approaches. This paper presents the shared views of the group.

2. The Industry

The aluminium industry is an expanding, global, capital intensive industry that requires continual technological innovation to maintain its competitiveness.

The main properties which make aluminium an essential and valuable material are its light weight, strength, recyclability, corrosion resistance, durability, ductility, formability and conductivity. Due to this unique combination of properties, the variety of applications of aluminium continues to increase.

The metal is produced either through electrolytic processing of aluminium oxide or through secondary recovery of metal from scrap. There is little difference between the price paid for the primary metal and metal derived from scrap, thus making the scrap a valuable commodity, which encourages recycling.

The metal, either as primary aluminium or as alloy, is traded as a commodity on several exchanges, such as the London Metal Exchange (LME). Primary aluminium (metal processed directly from aluminium oxide) is produced in 45 countries representing every continent except Antarctica.

The major producing countries are located in both developed and developing countries including Australia, Brazil, Canada, China, the EU, the Gulf States, India, Norway, Russia, South Africa, the U.S. and Venezuela. In recent years much of the plant expansion capacity has occurred in non-OECD countries e.g. South Africa and the Arabian Gulf States.

World primary aluminium production for 1997 was 21.4 million tonnes.

The leading aluminium producers are multinational companies with production, fabricating and distribution facilities around the world: Alcoa (U.S.), Pechiney (France), Alcan Aluminium Ltd. (Canada), Reynolds Metals Company (U.S.), Billiton (U.K.), Norsk Hydro (Norway), Kaiser Aluminum & Chemical Corp. (U.S.), VAW (Germany) and Comalco (Australia).

The products of the industry are: alumina, primary ingot, alloys for casting, flat rolled products (sheet, plate and foil), extrusions, forgings, rods, wire, cable, pigments and powders.

The major markets for aluminium are transportation (automobiles, trucks, aircraft & aerospace and marine), packaging (cans, flexible packaging and foil), building and construction and electric transmission.

The leading user regions are North America, the European Union and Japan.

3. Aluminium and Greenhouse Gas Emissions

To produce metal, the aluminium and oxygen in alumina must be separated by electricity in the reduction process. This reaction takes place in carbon lined cells (pots), through which direct electric current is passed. The bottom of each cell acts as a cathode. Carbon is used in the cell to serve as an anode. Inside the cell, alumina is dissolved in a bath of molten electrolyte, composed mainly of cryolite. The electric current passing from the anode to the cathode separates the oxygen from the alumina which reacts with the carbon anode to form carbon dioxide, while the aluminium metal settles to the bottom of the cell to be siphoned off.

If the dissolved alumina concentration of the electrolytic bath falls below critical levels required for electrolysis, rapid voltage increases occur. This is called an "anode effect". Anode effects cause carbon from the anode and fluorine from the dissocated molten cryolite bath to combine, producing CF_4 and C_2F_6. These gases, like the CO_2 and other gases are emitted from the exhaust ducting system or other pathways from the cell.

In terms of the emissions of GHG under the Kyoto Protocol it should be noted that while making progress on all fronts, aluminium companies in a number of countries have, through voluntary agreements, cut PFC emissions by 23 - 78 percent following the different national 1990 situation.

The "global warming potential" (GWP) for the PFC compounds is relatively high.

One tonne of CF_4 emission is equivalent to approximately 6500 tonnes of CO_2, for C_2F_6, the GWP is 9200. Thus, depending on the technology used, PFCs can result in CO_2 equivalent emissions from primary aluminium plants ranging from few % to 80 % of the total greenhouse gases emission from the smelting process.

The respective shares of GHG emissions produced in OECD and non-OECD countries are set out in the attached table:

GHG Emitted by Aluminium Smelters

	Primary Aluminium Smelting Capacity	GHG Emissions (without electricity)	Difference
OECD	50%	42%	- 8
Eastern Countries	15%	22%	+ 7
Total Annex I Countries	66%	64%	- 2
Non-Annex I Countries (without China)	25%	22%	-3
China	9%	13%	+4
Total Non-Annex-I Countries	34%	36%	+2

Based on available estimates and data on global GHG emissions from all man-made sources, aluminium production accounts for 0.5 percent of this total from its smelting and manufacturing processes.

4. Aluminium Industry GHG Reduction

The aluminium industry has a long tradition of process improvement. It has emphasized increased energy efficiency and pollution reduction and prevention. In 1997, one of the newest smelters employing the latest technology used 30 percent less energy to make one tonne of aluminium than was used on the average in the 1950s.

According to preliminary results of a draft US EPA Survey "International Efforts to Reduce Perfluorocarbons (PFC) Emissions from Aluminium Smelting", aluminium producers in 10 countries have agreed with their respective governments, on a voluntary basis, to reduce greenhouse gas emissions from aluminium smelting: Australia, Bahrain, Brazil, Canada, France, Germany, New Zealand, Norway, the U.K and the U.S.

Reductions ranged from 23 - 78 percent following the different national situation. For nine of the ten programs the base year was 1990.

Life cycle inventories demonstrate that on a life cycle basis, aluminium can make an even more significant contribution through applications. In the transportation sector, for example, aluminium products are light weight and durable, and can result in a lighter vehicle. Over the lifetime of the vehicle a substantial reduction in fuel use can be achieved that results in a significant decrease in greenhouse gas emissions.

When the metal is recycled both energy consumption and GHG emissions are reduced because it requires only five percent as much energy to make aluminium from scrap as it does from alumina. Over 35% of the total metal supply comes from recycled products and the recycling rate is expected to grow.

Work is going forward on technologies and practices intended to increase the amount of metal recovered from scrap and the by-products of melting. In other words, getting more metal from the dross resulting from melting scrap, while at the same time reducing the amount of dross produced during the melting stage.

In the last analysis, the Kyoto Targets are a matter for governments. Each of the signatories will have to decide how they will address their responsibilities under the Protocol and how they will approach their civil society, how they will maintain their ability to foster sustainable economic growth and deal with any resultant economic dislocation.

5. GHG Policy Issues

The subject of climate change and the enhanced greenhouse effect encompasses economic, energy, environmental and social implications of significant proportions.

To ensure that significant efforts to reduce GHG emissions will be considered as the opportunities arise, the aluminium industry is requesting governments to understand its basic needs for:

Confirmation of 1990 as the base year for validating reductions in GHG for the first commitment period under the Kyoto Protocol (2008-2012).

Credit for early action to ensure full recognition for actions taken;

Voluntary agreements as the accepted method of seeking GHG emission reductions in the future;

Recognition that energy taxes are counterproductive as a mean of securing action;

A regime which fosters appropriate emission trading schemes which allow the attainment of the economic and environmental benefits possible from implementing technology improvements which reduce GHG emissions at the lowest marginal costs;

Acknowledgement of the life cycle implications of the use of a material, such as aluminium, whose application in the transportation sector, for example, can result in a significant reduction in GHG emissions over the life of the application;

Third party certifications on reporting requirements, as well as, use of ISO 14000 and EMAS; and

The agreement of the developing countries to establish a process for negotiating meaningful emission reductions targets and timetables.

In regard to the worldwide dimension of the aluminium industry, a prerequisite for international actions is a common approach on the industry's GHG emissions. On a global basis the industry, acting voluntarily through regional and national associations and the IPAI, together with their respective governments have created data bases and are looking at ways to expand data collection.

6. Kyoto Mechanisms

With regard to the Kyoto Mechanisms, it should be understood that "heroic" efforts are not likely to occur. Investments in the form of JI or CDM will happen when the appropriate market conditions exist.

It is generally believed that demand for aluminium will increase and that recycling and primary aluminium production will be expanded. Where and when new facilities will be built will depend on the dictates of the market place and not the availability of flexible mechanisms.

We believe that we are still at the beginning of a complex process that will take years to develop and implement. Industry's task is to insure that as the details of the mechanisms are shaped the fundamentals that drive investment decisions, capital allocations and technological developments are given their full value.

Credit : This discussion paper could not have been elaborated without the help of Barry Meyer from the US Aluminum Association, the assistance of the Secretariat of IPAI and all the reviewing work of numerous colleagues from aluminium companies.

BIAC/OECD/IEA WORKSHOP ON CLIMATE CHANGE:

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CHEMICAL INDUSTRY

Royce Laffitte, Eastman Chemical Company
Francesco Balocco, Dow Europe S.A.

1. The Industry

1.1 Who is the Industry?

The Chemical Industry transforms natural raw materials from earth, water, and air and converts them into essential products for consumer and for the other industries of the world. The Chemical Industry is a worldwide industry with major international trading between countries. The world chemical industry output in 1997 was about 1.5 trillion dollars.

1.2 What products do you produce?

Products of the chemical industry are everywhere. Very few goods and services are produced in modern industrial societies without some input from the chemical industry. Synthetic fibers, pharmaceuticals, packaging materials, paints, adhesives, synthetic rubbers, plastics and insulations are only a few of the thousands of the chemical industry's constant stream of new and innovative products. It is important to note that the chemical industry creates numerous products that are essential to other industries and consumers in improving their energy efficiency and C02 emissions performance. Insulations, lubricants, and plastics are among the most common examples of the "enabling" nature of the chemical industry.

1.3 What share of the GHG emissions do you produce in OECD and Non-OECD?

The estimate of the C02 emissions for the US Chemical and Allied Products and the European Chemical Industry for the year 1997, expressed as tons of pure carbon, including the imputed carbon from the purchased electricity for the industry, was about 119 million metric tons of carbon.

1.4 What does your Industry intend to do to contribute to the Kyoto targets?

As discussed below in section 2, the chemical industry in the US and Europe plan to continue with their existing voluntary programs related to energy efficiency improvement on an energy consumption per unit of product basis. However, the imposition of absolute greenhouse gas reduction targets on the chemical industry would be tantamount to rationing fossil fuels and would entail unacceptable limitations on production of our products.

1.5 What are the implications and have you analyzed the cost of reducing emissions to the Kyoto target?

It would be impossible for the chemical industry to reduce by 2012 GHG emissions to the level foreseen in the "Kyoto Protocol," without curtailing the production of chemicals. A study performed by Charles River Associates of Washington DC for the U.S. Chemical Manufacturers Association on carbon emission trading indicated major costs to the US chemical industry of about 3 billion to 20 billion dollars per year for that industry for the absolute greenhouse gas reduction targets called for in the current protocol. As far as Europe is concerned, an 8% absolute CO_2 reduction target in the year 2012 imposed on the European chemical industry would constrain average annual growth between 0.8 and 1.7% at best, down from the 2.7% observed in the years 1985-1996. The opportunity cost, expressed in terms of foregone added value is between 15 and 26 billion dollars per year.

2. Voluntary or negotiated agreements to reduce GHG emissions in particular energy efficiency

2.1 What experience and history does your Industry have with energy efficiency improvements and voluntary or negotiated agreements?

The European chemical industry has been engaged in a Voluntary Energy Efficiency Program (VEEP) aimed at reducing its specific energy consumption. Over the years 1980-1995 fuel and power efficiency increased by 30% and C02 emissions per unit of output was reduced by 40%. In November 1992, CEFIC has launched VEEP 2005 which is a unilateral commitment to reduce its specific energy consumption by a further 20% between 1990 and 2005. The US Chemical Industry has increased its energy efficiency by 47% between 1970 and 1997. The US Chemical Manufacturer's Association will continue to promote its voluntary Energy Efficiency Continuous Improvement Program.

2.2 What are the barriers to energy efficiency improvement and successful use of energy efficiency agreements?

The barriers to further energy efficiency improvements are the thermodynamic limits of the various processes in use, the availability of new breakthrough technology, the remaining useful life of the existing plants, and the limited capital available for investment.

2.3 How can voluntarily negotiated agreements be made more credible?

Voluntary energy efficiency programs have been very successful and have provided a continuous source of efficiency improvements. Voluntary certification of the results by companies is one way to increase the acceptance of these programs as legitimate tools.

3. Flexible Mechanisms (General)

3.1 Can each company in your Industry verify its 1990 baseline? On an Industry basis?

It is likely that a credible determination of 1990 emissions can be made by most companies from their records.

3.2 Can flexible mechanisms work without an absolute emissions CAP? If so, how?

Some of the flexible mechanisms could be applicable with voluntary relative targets of carbon (or energy) efficiency i.e. energy use per unit of output. For energy intensive industries an absolute cap is not acceptable, since it will limit its growth potential. This is why the chemical industry is concerned about an absolute emissions cap.

4. Credit for early action

4.1 Does your Industry support early credit? Why or why not? In what form?

There is likely to be an extended period of time in which there will continue to be uncertainty regarding the climate change issue. As a result, companies may be deterred from taking voluntary early actions to limit greenhouse gas emissions prior to the outcome of the debate and any resulting proposals or protocols. CMA and CEFIC support a credit for early action system that will provide a framework to encourage voluntary near term actions and to enable the accounting for actions taken by companies to control greenhouse gases while international and domestic policies are being debated. It is essential that a mechanism exist to capture any proactive voluntary emissions reductions to ensure that any voluntary actions be recognized in any future government greenhouse gas programs. Section 1605 b of the Energy Policy Act of 1992 is the proper process for accounting for the credits in the U.S. The U.S. Clean Air act is not an appropriate vehicle to accomplish this activity. In Europe the debate on early credit is in its infancy. However, the European chemical industry has achieved substantial energy efficiency improvement starting in the 80's. CEFIC believes that some form of early credits needs to be established in order to capture the proactive emission reductions made in the past.

4.2 How can early action be encouraged?

Voluntary early actions can be encouraged by refining or developing further the above described processes.

5. CDM

5.1 Will CDM projects be cost effective for your Industry?

The effectiveness of CDM's depends on the rules for its application and on the potential value of GHG's credits.

5.2 What are the drivers that will result in CDM projects?

The basic driver for use of CDM's is the promise of emissions credits for future potential emissions reductions, starting as early as the year 2000.

6. Joint Implementation

6.1 Will your Industry do JI projects with Kyoto ratification? Why or why not?

It is unclear whether the chemical industry will engage in JI projects on a grand style. Companies will certainly look at them on a case by case basis.

7. Carbon sinks/sequestration

7.1 Does your Industry support development and or protection of carbon sinks as a policy option? Why or why not?

Voluntary measures by all economic sectors in all countries to reduce emissions, improve energy efficiency and remove greenhouse gases through sequestration or sinks appear to be an appropriate means of reducing greenhouse gas emissions. CMA and CEFIC support voluntary efforts to this end.

8. Emissions trading

8.1 Do you support emissions trading? Why or why not?

The chemical industries do not support absolute greenhouse gas emissions reduction mandates because they are fundamentally inconsistent with economic vitality and international competitiveness. An emissions trading scheme presupposes just such a mandate. The methods used to address global climate change may have potentially large impacts on national and global economies from mitigation and adaptation measures. Substantive and publicly available economic analyses with realistic assumptions indicate that substantial CO2 reductions will be extremely costly. While a well-designed trading program has the potential to somewhat reduce these costs, substantial and complex questions on key implementation and equity issues remain unresolved. For now, metrics which allow for continued economic growth, such as energy efficiency, carbon efficiency, and/or greenhouse gas efficiency, are the appropriate means of assessing progress in reducing greenhouse gas emissions.

8.2 What are the barriers to a successful national and global emissions trading regime?

The barriers are the cost to business and consumers, the impact on economic growth, and international wealth transfers. Uncertainties around key policy issues include credit ownership, credit tracking, buyer/seller liability, system leakage, and compliance enforcement.

8.3 What is similar and different about SO2 and CO2 trading?

There is a major difference between the number and nature of emissions sources. There are an extremely large number of mobile and stationary CO_2 sources compared to a relatively small number of- and essentially stationary- sources for SO_2. There is technology that is both economic and available to remove SO_2 without drastic negative economic impact on the ability of a company to produce- or increase production- of its products. There is not similar technology for CO_2.

9. General comments

The answer to any of the above questions should not be interpreted as an endorsement of the Kyoto Protocol in its present form.

Voluntary measures by all economic sectors in all countries to improve energy efficiency and reduce greenhouse gas emissions are appropriate. The imposition of absolute greenhouse gas reduction targets on the chemical industry would be tantamount to rationing fossil fuels and would therefore entail unacceptable limitations on economic growth and production in the chemical industry.

BIAC/OECD/IEA WORKSHOP ON CLIMATE CHANGE:

INDUSTRY VIEW ON THE CLIMATE CHANGE CHALLENGE WITH SPECIAL EMPHASIS ON THE KYOTO MECHANISMS

THE CEMENT SECTOR

Patrick Node-Langlois, Lafarge
David S. Cahn, California Portland Cement Co.

1. Cement Production and CO_2 emissions

1.1. How is cement made ?

Cement is made by heating limestone (and some other ingredients) to 1450° C in a kiln. The resulting « clinker » is then ground with a small amount of gypsum into a powder - Portland cement. Some types of cement also include by-products from other industrial processes (granulated blast furnace slag and fly ash from power stations for instance).

1.2. Dry and wet process

1.3. Sources of CO2 :

Energy : fossil fuels and electricity
Decarbonation : $CaCO_3 \Rightarrow CaO + CO_2$

1.4 Global carbon emissions from cement production

1994 M.T	Cement production	Total Emissions	Kg/T cement
OECD countries	422	85	202
World	1380,9	307	222

2. How has the cement industry contributed so far ?

2.1. The OECD cement industry has been contributing towards the reduction of CO_2 emissions in various ways.

- By improving manufacturing processes ...
  - Enhancing the energy efficiency of cement kilns.
  - Process conversion away from less energy efficient processes to dry and semi-dry processes.
  - Modernising plant and machinery to reduce electricity consumption with consequent reduction of CO2 emissions from power plants.

- By concentrating more production in the most efficient plants.....

- By « valorising » wastes in the production process ....
  - Using certain wastes productively as alternative fuels in the cement kiln « valorises » and eliminates wastes that would otherwise be incinerated or landfilled with resulting emissions of greenhouse gases. Waste used as fuel can be considered CO2 neutral. Therefore, some governments have already credited the cement industry for the equivalent CO2 emissions.
  - Using other wastes as raw materials for cement clinker production.

- By optimising the composition of cement ....
  - Using blast furnace slag, power station fly ash, natural pozzolana or limestone as a constituent of the final cement reduces the clinker required per tonne of cement. This means lower CO2 emissions.

- By improved products ...
  - Increased strength performance has led to more efficient use of cement.

2.2. Since the « 70s » the energy required to produce cement clinker has fallen by about 30% in Europe and North America.

2.3. Voluntary agreements

- Reduce fossil fuel CO_2 emissions by 25% in France between 1990 and 2000 and the CO_2 emissions per tonne of cement by 10%.

- Reduce specific fuel energy consumption by 20% in Germany between 1987 and 2005 (equivalent to CO_2 reductions of 3 million tonnes/year by 2005 based on 1987 production levels).

- Reduce the energy efficiency index by 21% in The Netherlands between 1989 and 2000.

- Reduce fuel consumption per tonne of clinker in Canada at a rate of 0.7% per annum between 1990 and 2000.

- Promote manufacturing process energy efficiency in the U.S.A. Over 50% of US cement production capacity is participating in the EPA climatewise program.

- Introduce a Greenhouse Energy Management System by each cement company in Australia with action plans for abatement.

3. <u>The OECD cement industry can contribute. How ?</u>

3.1. The OECD cement industry believes in sustainable development.

What is important, is to look at the final product : a building. A building has to be made with quality products with the least CO_2 content and in such a way that a maximum of energy is saved. In other words, cement industry must look at the concrete itself and not just its ingredients. This means that it has to research high value added and insulating concretes and mortars.

Meanwhile cement industry still has to work on better energy efficiency, the use of secondary fuels and materials, new process technologies, etc ...

This can be achieved through voluntary agreement and the use of "flex mechs". Actions taken must be "no regret" or else cement industry will not be in business. In order to develop new technologies it needs cash flow and public incentives. Clean Development Mechanisms (CDM) can be an interesting tool as long as there are new technologies to be transferred to developing countries.

3.2. Contribution of the European cement industry

- The European cement industry wants to make a greater use of voluntary agreements. Existing voluntary agreements have been effective in motivating the cement industry to improve emission reduction performance in flexible ways.

- The European cement industry is interested in the use of flexible mechanisms : Joint Implementation, C.D.M., emission trading. Early actions have to be credited.

Why ? The European cement industry is close to the limit of what can be achieved by technical means. With Pacific OECD countries, Europe has the lowest CO_2 emissions/T cement.

3.3. The US cement industry supports voluntary efforts geared towards improved energy efficiency. It is intrigued by the concept of emissions trading which should be studied further. It has not yet formulated a position on "flex mechs". However it would likely consider participating in CDM projects and obtain credit. The most significant barriers in that case would be high transaction costs and unclear credit scheme.

3.4. The Canadian cement council has developed a strategy in three points :

- continuous improvement of energy efficiency,
- technological innovation to reduce the cement content in concrete,
- sustainability of concrete as far as environment is concerned.

4. <u>A Joint Implementation pilot case between France and Czech Republic</u>

4.1. The project

- Modernisation of a cement plant in the Czech Republic
- Avoidance of some 33 600 t CO_2/year compared to baseline (at full production) over 5 years.
- Two years of negotiation with civil servants on both sides.
- Approval obtained from both governments and registration with UNFCC Secretariat. One of 26 cases registered by the secretariat ; the only cement case.

4.2. The key issues

- Additionality to doing business as usual; this clause applies well to demonstration projects (windmill, photovoltaïc, fuel switching ....). It does not make sense in case of industrial projects and especially energy efficiency projects.
- Baseline calculation ; it depends on the type of projects : greenfield revamping, carbon sink, ...
- Project duration ; time beyond which it is reasonable to think that one can expect new improvement in energy efficiency.
- Early crediting ; if not, there is no incentive for early action.
- Registration with secretariat is a minimum ; there is a need for an international body for reporting and control.
- No caps needed ; the European cement industry is committed to do all possible efforts domestically through voluntary agreement ; the use of flexible mechanisms is complementary.

Global carbon emissions from cement production

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AUTOMOTIVE INDUSTRY

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The automotive industry, the manufacturers of all sorts of road and also some off-road vehicles, is in a particular situation with regard to the debate about GHG emissions reduction.

As a manufacturing industry with a medium sized energy consumption, the automotive industry is in agreement with the general policies pursued by industry in general. GHG emissions per unit produced are declining because of both deliberate efforts to incorporate environmental policy goals into business strategies and progress in energy efficiency of manufacturing equipment, logistics and processes. In general and in the medium term there is a positive correlation between lower GHG emissions and lower costs. However, it would be wrong to conclude that this could be accelerated through regulatory measures without harming at the same time economic growth, employment or the relative competitiveness of the companies concerned.

On the other hand, the product of the automotive industry, the motor vehicle, is regarded as one of the principal sources of man made GHG emissions. Both governments and the public opinion have a tendency to assign the responsibility for these emissions to the automotive industry. Hence they believe that action on the industry and its products will produce the best results in reducing GHG emissions from road traffic.

This presentation will examine the following issues:

- Contribution of road transport to GHG emissions
- Road transport and the Kyoto targets
- Renewable energies and GHG free emissions
- Voluntary agreements vs. regulatory measures
- Product requirements vs. conditions for use
- Monitoring of GHG emissions
- The use of “Flexible Mechanisms”

1. <u>Contribution of road transport to GHG emissions</u>

Among the GHG emissions produced by the motor vehicle, CO_2 represents by far the most important quantity. CO_2 accounts also for 80 % of the total global warming potential of all six greenhouse gases. According to OECD sources, each year some 800 billion tons of CO_2 are produced in this world. Of this, some 96 % are of natural origin and 4 % are man made. The contribution of the transport sector to these 4 percentage points is estimated to amount to between 16 and 22 %, road transport alone representing some $4/5^{ths}$ of this. Hence, of the total annual CO_2 emissions that may have an impact on the global climate, emissions produced by road transport represent some 0,5 to 0,7 %, all other man made CO_2 emissions together (primarily households and commerce, industry, electricity and heat production) 3,3 to 3,5 %.

Therefore, whatever action is taken to stabilize or decrease CO_2 emissions from road transport, it will only have a very limited global impact – certainly insufficient to prevent possible damage as a result of global warming. On the other hand, under the principle of precaution it is certainly justified that also the motor industry makes its best efforts to avoid unnecessary increases in the production of GHG emissions.

In this respect it is essential to establish reliable forecasts on likely future CO_2 emissions from road transport. In its 1998 Communication on transport and CO_2, the European Commission advances the theory that the share of man made CO_2 emissions produced by transport in the EU increased from 19 % in 1985 to 26 % in 1995, and is likely to increase further in the order of 40 % by 2010 compared to 1990 levels. The OECD estimated that the increase in CO_2 emissions from road transport in Annex 1 countries would amount to between 40 and 150 % in the period 1990 to 2025.

These are worst case scenarios based on an extrapolation of past trends that are no longer representative for the present time and certainly not for the future in mature or maturing markets. OICA, the world federation of associations of the motor industry submitted in 1995 a study to CEMT in which it used a mathematical model based on realistic assumptions regarding both possible developments in vehicle population and average travelling distances. This study arrives at the conclusion that overall fuel consumption in Western Europe – hence also CO_2 emissions - will start to decrease progressively, to reach by 2010 a level possibly some 12 % below 1995.

2. Road transport and the Kyoto targets

The EU has accepted to reduce its GHG emissions by 8 % between 1990 and 2008-2012. In the Communication of 1998 mentioned before, the European Commission expresses fear that, left unchecked, growth in transport CO_2 emissions would make it extremely difficult to achieve the CO_2 emission reduction target agreed at Kyoto.

CO_2 emissions from road transport depend on both the vehicle and its usage, on annual mileage and on the driving pattern. Everybody knows the large differences in fuel consumption between driving at steady and modest speed on a motor way and driving in urban traffic at peak hours. A car carrying a horse trailer at a steady speed of 80 km/h may produce substantially more CO_2 than another car cruising at 180 km/h. Real fuel consumption and hence CO_2 emissions may easily vary by as much as 30 % up and down compared to the average tested standard fuel consumption. And finally, a car producing 170 g CO_2/km and running 40.000 km/year will still produce more than twice as much CO_2 than a bigger, heavier but also more comfortable and safer car, producing 255 g CO_2/km but running only 25.000 km.

Usage has a further impact, notably in goods transport: If certain goods, to be transported from A to B, and other goods, to be transported from B to A, are moved by the same truck on its way from A to B and back to A, only about half the CO_2 is produced compared to a situation where, due to bad logistics or because of restrictive regulatory requirements, two different trucks move these goods and return empty. The same applies, of course, to passenger transport: Driving to the same destination, one car used by several persons produces less CO_2 than several cars, each occupied by one person only.

All these factors may multiply or divide CO_2 emissions of individual motor vehicles easily by factors of two, three or four in comparison to the standard emission values of the average vehicle. In comparison to this, the influence of technical measures geared at improving fuel efficiency of motor vehicles seems ridiculously small.

Over the last 20 years the industry has successfully responded to environmental concerns. The average CO_2 emissions of light vehicles have been reduced in the US from some 280 g/km down to 260, in Europe from 200 g/km down to 170, and in Japan (there is no 1980 data available) down to 175 g/km. Relative Fuel consumption of heavy commercial vehicles has dropped by some 20 % over the same period.

During the course of last year, ACEA, the EU association of motor vehicle manufacturers, has entered into a voluntary commitment vis-à-vis the European Commission to reduce average CO_2 emissions of all its new cars, sold in the EU, to 140 g/km by 2008. Compared to the actual situation of 170 g/km this represents a reduction of nearly 18 %, far beyond the percentages of the EU's Tokyo commitments.

Of course, there is a certain risk that some of this progress in reducing CO_2 emissions may get lost because of the coming into force of tighter emission regulations on other gazes or particulate matters. Since 1983 the fuel consumption of a medium sized car – let's say of 7,1 l/100km at that time – has been brought down in 1997 to 6,6 l, a net improvement of 7 %. However, in the meantime new requirements on safety, emissions, noise, quality and comfort would have increased the fuel consumption by 21 % to 8,6 l. Hence, the net improvement in fuel efficiency had to be some 28 % to achieve the net gain in 7 %.

3. Renewable energies and GHG emission-free fuels or propulsion technologies

There are not many renewable energies easily used for road transport. Bio-mass methanol seems to be the only one besides electricity produced by other means than burning fossil fuels. Hydrogen is another one though it is not as easy to stow and distribute.

The use of electricity for propelling motor vehicles is a known technology and there are – in fact since many years – battery powered road vehicles in service. Several manufacturers run test and development programs to optimize such vehicles to meet customer expectations and to be economically viable. Success is limited and modest so far, primarily because of problems with battery technology. Even the best and most modern batteries have a limited span of life, are voluminous and heavy. Recharging and disposal are further problem areas.

From a GHG policy viewpoint, bio-mass produced methanol seems to be the most tempting alternative to petrol. The discussion about using methanol as an additive to traditional petrol is not new; it does not pose any major challenges for motor vehicle manufacturers. So far the biggest obstacle to a wider use of this alternative fuel has been the lack of availability due to high production costs and other problems outside the competence of the motor industry.

One promising technology seems to be fuel cell technology run on hydrogen or methanol which is GHG emission free or nearly GHG emission free. It may be on the road some years from now but it is too early to draw firm conclusions on the impact which this technology may have on GHG emissions from road transport and on which fuel it will run eventually.

4. Voluntary agreements vs. regulatory measures

Would it be possible to achieve even better results in the improvement of fuel efficiency of motor vehicles if regulatory, compulsory measures were introduced instead of leaving the matter to voluntary industry commitments? The US have gone that way and Japan is planning to introduce regulatory requirements in the near future.

The American CAFE system has not been detrimental for the US industry only because of the relatively similar product line of the three principal US motor vehicle manufacturers and the relatively great variety of models and volume of output of each of them, which permitted a certain in-house balancing. CAFE has, however, produced distorting effects on imports.

More worrisome is the planned Japanese regulation based on a weight-related approach. In each weight class all manufacturers should attempt to reduce the fuel consumption of their vehicles to the level of the “best in class”. The net effect is that the objectives for the improvement of fuel efficiency are random chosen and may therefore be quite arbitrary. Perhaps not intentionally, but the fuel reduction requirements are highest in those weight classes where one finds most of the imports.

The absolute and relative progress in fuel efficiency achieved in Europe on the basis of voluntary agreements are the best proof that such voluntary agreements work at least as good if not better than regulatory measures, provided they are supported by market conditions. Fuel prices in Europe have always been relatively high. Hence, there has always been an interest of European consumers to buy fuel-efficient cars.

However, while the European consumer has an interest in saving fuel (hence, in keeping CO_2 emissions low), he is not limited in his choice. As a consequence the European motor industry has not suffered in its international competitiveness through regulatory constraints and has regained strength since the “oil crisis” in the early Eighties despite hefty competition from the Japanese and the Korean industries.

Regulation on fuel consumption would have had a devastating effect on the very heterogeneous European motor industry, since there is no easy, meaningful and non-arbitrary formula to regulate fuel efficiency in the same way, e.g. for Porsche and Fiat.

Any sophisticated regulation, however, that tried to respect the heterogeneous nature of the European motor industry would probably have to be related to technical specifications of the vehicles, e.g. to engine size or power or to vehicle weight. Automatically, this would limit the engineering choice of manufacturers and restrain them from competing effectively. On the other hand, it would also be an incentive to manufacturers to satisfy themselves with meeting the minimum criteria and not to make any efforts beyond. It may even lead to perverse results like making a specific model slightly heavier just to make it fall into a category that tolerates higher fuel consumption, because it may be cheaper to increase the weight than to develop an entirely new engine family.

Moreover, regulation is always expensive both for the regulated industry and for the government administration that has to apply it. The principle of proportionality, correctly applied, would clearly stand in the way of regulating fuel consumption in Europe, and it certainly does not support fuel consumption regulations in the US and in Japan.

Finally, why move to regulation when the results achieved through voluntary agreements are quite satisfactory and when the potential of exercising any positive effect on climatic conditions is as limited as it is in this case. Remember that there is not even an attempt of any scientific evidence that cutting the 0,5 to 0,7 % that road transport contributes to global CO_2 emissions by 10, 15 or 20 % would make a real difference. What counts is that all parties concerned make their best effort to keep GHG emissions as low as reasonably possible.

5. <u>Product requirements vs. conditions for use</u>

Most of what has been described before relates to technical measures applied to the product with the net effect of keeping the emissions of GHG per km driven, measured according to a standardized method, at the lowest possible level. The absolute level of fuel consumption and therefore also of GHG emissions, during a given period of time depends, however, only to a limited extent on the technical features of the vehicle: mileage and driving pattern play an important if not a predominant rule.

Hence one would expect governments to concentrate on this aspect even more than on the product to ensure that the Kyoto targets are also met by road transport. Up to now, however, it has apparently not been possible for any government to develop any comprehensive and politically acceptable strategy on regulating the use of motor vehicles with the intention of keeping GHG emissions under control. There are only several isolated initiatives like speed limits, restrictions on the use of private transport in certain parts of cities, measures to make driving or parking difficult and even attempts to let market forces play (taxation).

Many of these measures have either little effect on GHG emissions or may even lead to an increase, e.g. by obliging drivers to circle a bloc several times before he finds a parking space or to reduce speed in front of “sleeping policeman” and accelerate thereafter etc. Other measures are in reality more inspired by classical considerations of revenue rising, e.g. high taxes on the acquisition of cars with large engines under the pretext that they have a higher level of pollution.

Really efficient measures should not be repressive in nature, should not restrict the choice and not prohibit the acquisition of motor vehicles, but should induce people to use their motor vehicles more rationally with particular attention to environmental considerations. Education and well-organized and efficient public transport, a high level of comfort and security and perfect interfaces between public and private transport is the answer, but it is rarely found in reality.

Liberalization of goods transport, the increase in permitted maximum weights, reasonable policies permitting combined transport road-rail-water and dedicated lanes to goods vehicles on motor ways are some of the more successful and positive policies related to the fuel efficient use of motor vehicles.

6. Monitoring of GHG emissions

Virtually all voluntary agreements on the reduction of fuel consumption, concluded primarily with national governments, have been accompanied by monitoring systems. Two types had been developed: monitoring technical progress and monitoring market related progress.

Both monitoring methods are based on fuel consumption test that are part of type approval procedures (but only of a statistical nature; they are not related to any limit values!). Monitoring technical progress just compares the emission performance of the current line of models with that of their predecessors. The – more common – market related monitoring is based on registration figures and the corresponding fuel consumption data from the type approval documents.

Both monitoring systems are somewhat theoretic in nature since they are exclusively based on the standardized tests and not on the real use of vehicles. Representative figures on real annual GHG emissions are not easy to collect directly, the best and most reliable method is a calculation on the basis of motor fuels sold.

7. The use of "Flexible Mechanisms"

Under the Kyoto Protocol three new collaborative mechanisms have been established: clean development mechanism (CDM), joint implementation (JI), and emission trading (ET). Of course, also the automotive industry is involved in several of such projects but it has not yet exploited the possibility of using any of the GHG emission reductions so achieved as a compensation for its efforts to render motor vehicles more fuel efficient world wide.

Just to quote some examples:

- CDM: Projects in Brazil to use natural fibers as a renewable resource for certain parts like the interior of seats and certain padding panels. This replaces fibers normally produced by the chemical industry.

- JI: Most voluntary agreements are, in fact, joint implementation actions, because they are mostly combined with educative programs for drivers and expert advise to governments how they could support industry actions.

- ET: No projects of this nature envisaged for the time being.

In the short term, as long as overall CO_2 emissions do not sink as expected for the medium term – despite the over proportional progress in relative fuel efficiency of individual vehicles - road transport might need to look for using flexible mechanisms in order to find sources for compensation. But this subject has not been addressed yet.