

# Report of the Energy and Climate Special Event

*AEI Secretariat*

## Background

The *World Energy Outlook 2004* predicts that in the business-as-usual scenario, the world's energy needs will be almost 60% higher in 2030 than they are now. Fossil fuels will continue to dominate the global energy mix, meeting most of the increase in overall energy use. Hence, the contemporary energy situation poses a very serious challenge, particularly for the developing countries, which are more vulnerable to energy shocks and climate-induced natural disasters. The important concerns for emerging economies at this point in time are basically two-fold. First, the availability of energy to meet the growing demand poses a serious concern regarding energy security for developing economies, which are heavily dependent on energy imports. Sustainable development of a region will depend greatly on the reliability of energy supply at reasonable prices. For instance, as a net oil importer, developing Asia is vulnerable to high oil prices, and faces tough choices in limiting inflationary pressures and reducing fiscal burden due to fuel subsidies, which again hurt the region's growth momentum. Moreover, the world's vulnerability to supply disruptions may increase with geopolitical uncertainties. Secondly, climate destabilizing carbon dioxide emissions will continue to rise, given the current and projected high dependence on hydrocarbons. The path of development chosen by countries, which determines the future growth of energy and emission trajectories, will be greatly influenced by technological developments, economic cooperation between countries on energy security issues, and global cooperation in limiting GHG (greenhouse gas) emissions.

## Energy and Climate—a special event at DSDS 2007

In the context of the twin concerns of energy security and climate change, the 'Energy and Climate' workshop, organized as a special event on 23 January 2007 during the DSDS (Delhi Sustainable Development Summit) 2007, was designed to provide an opportunity for the energy and climate change

community to come together to identify issues for discussion that would help develop a collective and long-term vision for a more energy and climate secure world.

The workshop was organized by TERI and AEI, and supported by the Nand & Jeet Khemka Foundation.<sup>1</sup> Over the years, the DSDS has emerged as an important annual event, and a credible platform for international deliberation and dialogue on issues of long-term sustainable development. The DSDS was the most opportune time to organize this workshop, since it brought together prominent leaders in government, corporate, non-profit organizations, and other stakeholders, resulting in discussions for practical and workable strategies to take the sustainable development agenda forward. The workshop aimed to address the following questions.

- What is the impact of the changing energy landscape on the global climate system?
- What are the means through which countries aspire to address both energy and climate concerns?
- Is there any institutional mechanism through which the twin concerns of energy and climate could be addressed?
- How far do the international initiatives on energy and climate address concerns in the developing countries?
- How are the developing countries coping with energy and climate concerns?

The workshop was technically planned in two sessions. In Session 1, energy and climate concerns were discussed within an international perspective. Session 2 of the workshop dealt with more Asia-specific issues. Dr R K Pachauri (Director General, TERI and Chairman, IPCC [Intergovernmental Panel on Climate Change]) and Dr Adnan A Shihab-Eldin (Former Acting Secretary General, OPEC [Organization of Oil Exporting Countries] and Adviser to Kuwait Petroleum Corporation) chaired the two sessions respectively. The panel of speakers for the first session included Mr Claude Mandil (Executive Director, International Energy Agency); Dr Adnan A Shihab-Eldin; Mr C Dasgupta (Distinguished Fellow, TERI, India)

<sup>1</sup> The Nand & Jeet Khemka Foundation is an Indian public charitable trust, whose mission is to develop and promote institutions and initiatives that make a substantial impact on poverty, deprivation, and disempowerment of the human and natural environment through an approach that is long-term, strategic, and leveraged. It has launched, in partnership with the Resource Alliance, the India NGO Award—a new initiative aimed at advancing India's non-profit sector by promoting financial and organizational stability, and strengthening community support of civil society.

and Dr Jaakko Helminen (Senior Meteorologist, Finnish Meteorological Institute, Finland). The panel of speakers for the second session included Prof. Akio Morishima (Chair of the Board of Directors, Institute for Global Environmental Strategies, Japan); Dr Ajay Mathur (Director-General, Bureau of Energy Efficiency, India); Dr R B Grover (Director, Strategic Planning Group, Atomic Energy Commission, India); Mr Vikram Singh Mehta (Chairman, Shell Group of Companies, India) and Prof. Wei Zhihong (Former Director, Global Climate Change Institute, Tsinghua University, China).

## Session 1: summary of the presentations

### *The changing global energy landscape—supply and climate concerns,*

*Mr Claude Mandil (Executive Director, International Energy Agency)*

The world is on an unsustainable path as far as global warming is concerned. In the BAU (business as usual) scenario, CO<sub>2</sub> emissions worldwide will increase by more than 50% between 2007 and 2030. To combat this, technology breakthroughs such as carbon capture and sequestration and alternative energy sources such as nuclear and renewables are very much needed. This entails a lot of R&D, (research and development) with results that would be expected in the long term. Hence, energy-efficiency improvements are the key to immediate actions and immediate results if emissions have to be reduced. Every country in the world has to accomplish its share of increased energy efficiency, but it is even more important in countries that face the need for huge investments. Though the consumer countries agree that combating global warming is important, they consider that it is more important to resolve the shortage of oil in their economies given the 'peak oil theory'. On the other hand, the producer countries argue that it is not right if the consuming countries reduce oil consumption, since it is the only source of income for the former.

However, according to the speaker, the peak oil theory is probably not correct. If coal, gas, and biomass are all added to liquids, then there is no foreseeable future for peak oil demand. There will be enough oil in the future (though it will come from a limited number of countries, and in particular, from OPEC countries). Hence, in the long-term scenario, even with a lot of energy-efficiency improvements in consuming countries, oil consumption is likely to

increase. Hence, it is necessary to invest and increase production in OPEC countries even if consuming countries do their best to reduce their consumption of oil. For this to happen, there is a need for dialogue between consumers and producers to ensure that enhancement of energy supply capacity is well-coordinated with expected changes in energy demand over time.

### *Energy security and climate concerns from a producer perspective*

*Dr Adnan Shihab Eldin (Former Acting Secretary General, OPEC, and Adviser to Kuwait Petroleum Corporation)*

There is a strong correlation between energy consumption, development, and creation of wealth. Oil consumption is bound to increase in future, and if oil consumption has to increase in a sustainable manner then it has to be consistent with not only economic development but also with other sustainability issues such as the environment. It is expected that renewables will continue to grow by double-digit figures, but starting from a small base, it would be a long time before they became a significant part of the equation. There is also the probability of a resurgence of fission nuclear power. The peak oil argument is a matter of concern, since at present, there are about three barrels left for every barrel that is consumed. Further, there is a need to examine energy security challenges from both the consumer and producer country perspectives. Sustainability for consumers is very important, where adequate resources are needed at affordable prices, but sustainability from a producer point of view will deal with making timely investments to get good returns. With regard to the problem of sustainability of high energy prices, recent price rises were demand-driven but there were other factors at work, which made it very difficult to predict the probable stable price level.

With regard to energy consumption, even if developing countries grow, their per capita energy consumption will be very low as compared to that of the developed nations. The industrial countries had gone through the same phase in the past, and if a country was developing fast, it was inevitable that it would be wasteful. This raises the question of fairness and equity. Technological advances to improve the environmental credentials of oil production and use must accompany the expected increase in the use of oil. Developing and making fuller use of all such technologies in an orderly fashion will point towards more sustainable energy patterns, alleviating some of

the downside risks to oil demand (from the producers' perspective) and ameliorate the resulting uncertainties in the magnitude and timing of future investment requirements. The global dimension of the challenge points to the need for identification of opportunities for cooperation on technological issues as an important objective. Dialogues between consumers and producers have improved significantly over the last few years and it is expected that these dialogues would be action-oriented in the future.

On the other hand, when the producing countries talk about demand security, they do not ask the consuming countries to guarantee consumption at a certain level, but they ask for a more orderly view of what the demand policy is going to be and what the demand would look like in the future. In this respect, the issue of carbon sequestration is very important. Particularly, CO<sub>2</sub> sequestration with enhanced oil recovery should receive more attention both from the producers' and the consumers' point of view. It is important from the producers' point of view since all of the CO<sub>2</sub> that is going to be produced over the next 20–30 years could be put in the global reservoirs of oil and gas. According to the IEA (International Energy Agency) estimates, 50% of the CO<sub>2</sub> emitted in 2030 could be put into depleting oil and gas fields. However, most of the sources are not located near storage places—if this problem could be overcome, then it would be possible to augment global reserves quite substantially. A number of international collaborations on this issue already exist. For instance, the IEA had one international collaboration called Greenhouse Gas Reduction, which OPEC has joined or was about to join. However, most of these collaborations are still focused on R&D and on sharing information. What is needed is an international collaboration, led by the OECD (Organization for Economic Cooperation and Development) – well funded – and focused on launching demonstration projects in various parts of the world, particularly where large storage potential exists.

It is important that consumer countries such as India follow up on these demonstration projects, being a carbon-intensive country, and consider the possibility of transporting CO<sub>2</sub> back for reinjection to the nearby fields in the Gulf and, thereby, add to the oil recovery there.

### *Energy and climate in society*

*Dr Jaakko Helminen (Senior Meteorologist, Finnish Meteorological Institute, Finland)*

Energy and climate issues are very much societal issues. The important question that arises at this point

is how to create awareness of energy and climate issues amongst the general public. The IPCC and the media have raised the general awareness on climate change and mitigation as concepts fairly well. However, knowledge among the general public is still inadequate. There are great challenges to be faced in bringing these concerns to the level of general education and among societal topics.

Climate change risks can be reduced by reducing vulnerabilities and creating better early warning systems so that necessary buffers could be built to avert potential disasters. For long-term planning, if adaptation is considered, there are four different issues of concern. First, humans will have to adapt themselves to the normal and natural variability of climate. Secondly, planning is required for adaptation to long-term changes resulting from anthropogenic emissions of GHGs (greenhouse gases). Thirdly, human-induced climate changes must be strategically mitigated through GHG emission reduction; and finally, adaptation is required in social and economic systems in order to keep human-induced changes of climate below dangerous levels. There are several planning horizons associated with this, starting from the intermediate horizon (starting from one month to a few years) to the centennial horizon (stretching over 100 years). As far as institutional mechanisms are concerned, bridges must be built between islands of ignorance. This means that multidisciplinary and multi-organizational collaborative interactive work needs to be facilitated much more than it has been in the past. Here, resilience is needed both in national and international solutions, and a lot of stability and versatility is needed to act proactively. Outcome orientation is a key for constructive interaction. For developing countries, vulnerabilities must be reduced by strengthening the baselines. While summarizing, the speaker mentioned that energy and climate issues were increasingly interconnected with society. Energy considerations cannot be limited just to mitigation issues. Proactive energy sector actions need to be taken both in climate mitigation and adaptation, and there is need for a wider interaction between the energy and climate sectors.

### *Mitigating climate change: role of developing countries*

*Mr C Dasgupta (Distinguished Fellow, TERI, India)*

With negotiations in progress for the post-2012 Kyoto Protocol, the role of developing countries in climate change mitigation is increasingly being discussed and

debated. There are insistent calls on developing countries to take on new commitments after 2012, either emission limitation commitments similar to those of Annex I countries, or some form of alternative commitments, possibly energy-efficiency targets. However, before discussing the role of developing countries, it is necessary to clear up two widespread misconceptions. The first misconception is the oft-repeated assertion that developing countries have no commitments under the Kyoto Protocol. This is quite untrue, since Article X of the Kyoto Protocol lays down a set of common commitments applicable to all parties, Annex I and non-Annex I alike. The national communications of developing countries such as India, China, and Brazil detail many important measures that they have taken, which have significantly moderated the rate of increase of GHG emissions. While the Kyoto Protocol and the Framework Convention do include commitments for developing countries, the basis of their participation is different from that of Annex I parties. The second misconception concerns the implications of the inevitably increasing emissions originating from developing countries. It is being argued that these growing emissions would swamp any reductions effected by industrialized countries and that developing countries should, therefore, be required to limit their emissions. There is no doubt that there is a need to moderate the rate of increase of emissions originating in developing countries to a feasible extent. The real question is who should pay for it. The Framework Convention and the Kyoto Protocol made it clear that the industrialized countries should cover all incremental costs. The developing countries are thus, not opposed to moderating emissions originating in their territories. They only oppose the attempts to shift on to their shoulders a part of the financial burden, which under the Framework Convention and the Kyoto Protocol should be borne by the industrialized countries. However, it is important to strategize on what the developing countries can and should do.

First, the developing countries should intensify their implementation of the provisions of Article X of the Kyoto Protocol. Many measures designed primarily to promote developmental objectives also produce important co-benefits for mitigation. Measures to promote energy conservation or energy efficiency, for instance, may be designed primarily to promote development, but they also have an important co-benefit in terms of moderating emissions. Promotion of new and renewable sources of energy and nuclear energy may be primarily motivated by energy security considerations, but they also result in

cutting down carbon emissions. In all these cases, mitigation is a co-benefit, meaning that the measures could be independently justified by developmental considerations alone, and therefore these measures do not entail additional or incremental costs. The mitigation benefits of measures taken so far by these countries have largely been identified in retrospect. Climate change considerations should be integrated with development planning in this manner. This would result in important co-benefits for mitigation without any diversion of resources from the first and overriding priorities of the developing countries, which is economic and social development and poverty eradication. These measures could, for instance, include sectoral energy-efficiency targets. Sectoral targets or programmatic targets are more realistic than targets that could be set in a manner that avoids diversion of resources from priority developmental tasks. The speaker, however, emphasized that such targets were like all other planned targets, which were aspirational in nature. They must not be interpreted as constituting binding international commitments, just as growth targets of developing countries did not amount to binding international commitments.

The other important issue is that it is essential to raise the CDM (Clean Development Mechanism) from a project-based level to a sector or programme-based level. This holds the key to increased participation by developing countries in the international effort to mitigate climate change. This would facilitate equitable burden sharing between Annex I parties, and would answer the legitimate concerns of countries like Japan, which have already attained very high levels of energy efficiency and, therefore, feel that further commitments might involve disproportionately high costs for the economy. It would also provide much needed funds for adaptation.

A programmatic CDM would enable the developing countries to greatly increase their contribution to international cooperation and mitigation. It would encourage these countries to formulate and incorporate into their development plans sectoral or programmatic measures with climate change benefits.

### *Session 1 summary*

The main issues that emerged from Session 1 are summarized below.

- There are compelling reasons for shifts in the energy trajectory globally.
- To combat this, technology breakthroughs such as carbon capture and sequestration, alternative

energy sources, such as nuclear and renewables, are urgently required.

- Short-term focus on energy-efficiency technologies, which can have immediate impacts, is particularly important in developing countries.
- There is a necessity to invest and increase production in OPEC countries.
- While energy efficiency extends the life of reserves, there is need for dialogue between consumers and producers to ensure that enhancement of energy supply capacity is well coordinated with expected changes in energy demand over time.
- Sustainability for consumer countries is very important where adequate resources are needed at affordable prices.
- Demand security for producer countries does not mean asking for a guarantee of demand, but for an orderly view of demand policy and consequences.
- Making fuller use of technological advances in an orderly fashion will point towards more sustainable energy patterns, alleviating some of the downside risks to oil demand (from the producers' perspective), and ameliorate the resulting uncertainties in the magnitude and timing of future investment requirements.
- CO<sub>2</sub> sequestration with EOR (enhanced oil recovery) should receive more attention from both producers' and consumers' point of view.
- International collaborations led by the OECD and focused on launching demonstration projects in various parts of the world, particularly where large carbon storage potential exists, are the need of the hour.
- Linkages between India and the Middle East as an example can be considered, where CO<sub>2</sub> will be exported from India to the Middle East for EOR.
- There is a need for institutional changes to reflect climate concerns.
- There is a need to facilitate multidisciplinary and multi-organizational collaborative interactive work much more than it has been done in the past.
- Proactive energy sector actions are needed both in climate mitigation and adaptation.
- Developing countries should intensify their implementation of the provisions of Article X of the Kyoto Protocol.
- Measures to promote energy conservation or energy efficiency may be designed primarily to promote development, but they also have an important co-benefit in terms of moderating emissions.
- Mitigation is a co-benefit, which means that certain measures can independently be justified by developmental considerations alone and, therefore, these measures do not entail incremental costs.
- The CDM could play an important role, especially if it is programme- or sector-based rather than project-based, and holds the key to developing country participation in the international efforts to mitigate climate change.
- Countries such as India could set an example in energy transition to meeting the twin challenges of energy security and climate change mitigation because India is a large country and is going through the development process.

## Session 2: summary of presentations

### *Opportunities of the Asia-Pacific Partnership to address energy security and climate change in Asia*

*Prof. Akio Morishima (Chair of the Board of Directors, Institute for Global Environmental Strategies, Japan).*

The APP (Asia-Pacific Partnership) on Clean Development and Climate is an innovative new effort to accelerate the development and deployment of clean energy technologies. Ministers from Australia, China, India, Japan, Republic of Korea, and the United States established the APP in January 2006, agreeing to a charter, communiqué, work plan and the establishment of eight public-private task forces to implement the partnership's agenda. The task forces cover aluminium, building and appliances, cement, cleaner fossil energy, coal mining, power generation and transmission, renewable energy and distributed generation, and steel sectors. The basic objective of the APP is to encourage cooperation among countries to meet both the increased energy needs and associated challenges, including those related to air pollution, energy security, and GHG intensity.

With regard to the pattern of energy consumption in developed and developing countries, by 2010–2020, the primary energy demand of Asian and other developing countries would reach the levels of the OECD countries, or may even exceed those. When the energy intensities of India and China were compared to those of the rest of the world, the figure was found to be about ten times that of Japan, and five times that of the US. Hence, if both China and India cooperate, there is potential to increase the energy efficiency in these countries, and at

the same time, reduce GHG emissions, which could be a co-benefit to the countries.

The APP is a very new initiative and the task forces have just started work. Japan has already started to get involved in the steel and cement sectors. These two sectors were picked up to start with because 48% of world's steel and about 61% of the world's cement production comes from Asia. The intention of the APP is to put priority on the eight sectors as mentioned above, since these are some of the energy-intensive sectors, and promoting energy efficiency in these sectors would lead to co-benefits.

### *Can nuclear energy be a response to energy and climate in India?*

*Dr R B Grover (Director, Strategic Planning Group, Atomic Energy Commission, India)*

Hydrocarbon usage in India is about 2.5% of worldwide usage and this would grow to about 10% by the middle of the century. Also, at present, coal usage in India is about 6%, which could grow to over 45% of the likely world usage. The DAE (Department of Atomic Energy) report looks at present hydrocarbon usage in India, which is very low, but would grow to about 10% of global use by the middle of the century. This implies that an increase in the share of nuclear energy in India's energy mix, beyond what is possible based on the domestic programme is desirable to minimize stress on global fuel resources. This is also desirable from local, regional, and global environmental considerations. The Indian economy has a modest hydrocarbon base. The Ministry of Petroleum and Natural Gas has set a target to locate at least 12 billion tonnes as per the 'Hydrocarbon Vision 2025'.

In India, uranium resources reserves at present are about 61 000 tonnes, but thorium is available in plenty. The country has a three-stage nuclear programme. The first stage consists of PHWR (pressurized heavy water reactors) with 14 reactors operating and four under construction. There are also plans for more reactors, and currently, the biggest unit size is 540 MW (megawatt). Additionally, there are some light water reactors at Tarapur and at Kudamkulam on the East Coast in Tamil Nadu; the latter being under construction in technical collaboration with Russia. The second stage consists of fast breeder reactors, which have realized all technology objectives and have been operating since 1985. Based on this experience, the DAE has designed

a 500-MW fast breeder reactor prototype, which is under construction. The power potential through this route is very high. At stage three, there are the thorium-based reactors. A mini reactor called Kamini is in operation at Kalpakkam, and is used for neutron radiography and other experiments. The DAE has also designed a 300-MW advanced heavy water reactor, which was going through regulatory reviews. This reactor has been planned to gain large industrial scale experience in the handling of thorium. To summarize, it is a challenge to provide access to clean energy at affordable prices to all in the country. A country the size of India cannot afford to plan its economy on the basis of large-scale import of energy resources or energy technology. No single option can answer the issue of climate change. Indigenous development of energy technologies based on domestic fuel resources should be a priority for the country. Diversity of energy sources and technologies is necessary to ensure security of supplies. For India, nuclear power is one option. In order to limit energy import dependence in percentage terms at about the current level, nuclear power must contribute about a quarter of the total electric power estimated to be required by the middle of century.

### *Engaging the private energy sector in responding to climate change*

*Mr Vikram Singh Mehta (Chairman, Shell Group of Companies, India)*

Science has clearly established the implications of human activity on climate change and global warming, and the key issue now is the energy challenge in a climate-stressed world. Energy is the fuel for economic development and growth. Between 2007 and 2050, it is estimated that global energy consumption would double because of the increase in population and because of expanding economies. Hydrocarbons will continue to fuel economic growth, and in a sense, power people's lives, especially in countries like India. The important question is managing the CO<sub>2</sub> footprint, given the fact that hydrocarbons will remain the most accessible and affordable fuel source for the time to come. Alternative energy fuels, such as solar, wind, and biofuels, represent low CO<sub>2</sub> sources of energy; but as of today they are certainly not economically competitive with the conventional sources.

Shell as a company has made a strategic choice to work responsibly across a broad energy portfolio, and

this includes conventional oil and gas, gas to liquids and conventional oils, and also alternative energy. About 95% of Shell's portfolio is accounted for by conventional oil, including LNG (liquefied natural gas), which is the core of Shell's business. However, the company is also engaged in unconventional oil and gas technology, representing 5% of its business. Shell is the largest distributor of biofuels today. The company distributes about three billion litres of biofuels. It is also the biggest investor in wind energy. In India, the company has an MoU (memorandum of understanding) with leading car manufacturers to see how the frontiers could be pushed with regard to hydrogen use. Shell has very stringent CO<sub>2</sub> emission targets. The company has set itself a target to reduce emissions in 2010 to a level at least 5% lower than in 1990. The company has also increased natural gas production by over 30% between 1995 and 2005. Shell is currently pursuing a number of CO<sub>2</sub> mitigation and technology development activities in order to improve its ability to manage CO<sub>2</sub> emissions. These include energy-efficiency projects, reduction in flaring, and large-scale CO<sub>2</sub> sequestration demonstration projects. Efficiency improvements have already delivered CO<sub>2</sub> savings of approximately a million tonnes per year, and further investments are being made to exploit this potential. The company is playing an important part in developing alternatives to fossil fuels, and that is why it had invested a billion dollars in these businesses between 2000 and 2005.

With regard to the future course of action, it is important to acknowledge and recognize that every country and every company needs to choose its own way in addressing the world's energy challenges and in addressing the management of CO<sub>2</sub> emissions. Fundamentally, this issue should be addressed through a market-based approach. No one company, government, or particular stakeholder could indeed address this problem on its own: it requires a partnership. If one is looking for a public-private partnership, then it is important that governments identify the regulatory and the incentive framework very clearly. They should set very clear targets for emissions trading and other related policies beyond 2012, which would provide greater certainty with regard to the long-term value of certificates and a more stable investment climate. It is important to look for flexible market mechanisms like an effective cap and emissions trading scheme. Carbon capture and sequestration should be credited under the CDM. Finally, it is important to note that the absence of an appropriate investment climate would

limit the ability of companies to deliver on the required solutions.

### *Energy security and climate concerns: how is China coping?*

*Prof. Wei Zhihong (Former Director, Global Climate Change Institute, Tsinghua University, China)*

With regard to the energy consumption pattern in China, whereas the energy consumption mix in the world is 25.7% coal, 38.5% oil, 23.3% natural gas, and 12.5% consisting of others; the corresponding figures for China are 67.8%, 21%, 2.8% and 8.4% respectively. The energy-intensity figure in China is the highest among Asian countries. This is because of the high share of industries and low share of the service sector in the GDP (gross domestic product). It was understood that, for most important industry products, energy efficiency is about 20%–50% higher than that in developed countries. The challenges facing China at present include fast increase in energy consumption, fast increase in oil consumption and oil import, and severe shortage of electric supply in recent years. This has affected industrial production and daily household life. Primary energy consumption increased by 15.3% from 2002 to 2004. Oil and electricity consumption increased by 9.3% and 15.7% respectively during the same period. The fast growth in primary energy consumption was due to excessive growth of heavy and chemical industries, urbanization (average annual increase rate of 1% point) and the consumption structure shifting to car and housing. As far as the energy demand scenario is concerned, total energy demand in 2020 would range from 2500 MTCE (million tonnes of coal equivalent) to 3300 MTCE, and power capacity would reach 860–1000 GW (gigawatt). In 2050, total energy demand will be beyond 5000 MTCE and per capita energy consumption would increase to 2–3 MTCE in 2050, compared to 1 TCE in 2000.

At present, China is facing energy security challenges in terms of its oil production, which is expected to reach its peak of around 180 MT (million tonnes) in 2020, following which it will decrease. About 60% of oil and 40% of natural gas in 2020 will come from import and also from new coal production capacity of 1000 MT needed before 2020. The country also needs to improve its energy efficiency. The specific energy consumption for most energy-intensive products is 20%–50% higher than that of the industrialized countries. China is also the second

largest CO<sub>2</sub> emitter in the world, and its emission will increase in future. In 2020, if no additional control measure are taken, SO<sub>2</sub> (sulphur dioxide) and NO<sub>x</sub> (oxides of nitrogen) emissions could reach 40 MT and 35 MT respectively, exceeding their limits of 16 MT and 19 MT. The priority programmes for better energy management up to the year 2020 are energy-saving technologies, clean coal technologies, oil security supporting systems technologies, advanced nuclear energy technologies, and technologies of large-scale deployment of renewable energy facilities. China has been quite active in the matter of climate change. To set up the CDM management rules, the Chinese government has identified three major priority areas. These includes energy efficiency, renewable energy, and methane storage. As of January 2007, among the total registered projects in the world (477), China accounted for 36, and emission reductions for China accounted for 43% of the total emission reductions in the world. China will also establish some CDM funds from the CDM revenue to raise public awareness on climate change and support capacity building on climate change.

### *Clean energy and energy-efficiency initiatives in India*

*Dr Ajay Mathur (Director-General, Bureau of Energy Efficiency, India)*

Energy consumption in the Indian economy is growing fast and is expected to grow further. This will strain the economy and society in terms of limited domestic fuel availability, volatility in availability, and prices of imported fuels and negative environmental impacts. Hence, renewables and continuous energy efficiency increases are an essential part of the national energy strategy. The Integrated Energy Policy document also talks about the centrality of both renewables and energy efficiency in the energy picture, in the years to come.

As far as measuring energy intensities is concerned, if energy intensity is based on GDP at market exchange rates, then it is bound to be very high. On the other hand, if energy intensity is measured using GDP conversions based on power purchasing parity, then the picture is not as bad. It has been found that the intensities are more or less in the same band across countries. The issue is that both in India and in China, domestic energy consumption is extremely low. And once that was factored in, energy intensities would be low. The emphasis on energy

efficiency and renewables in this country is largely because of deficit in energy supply and lack of access to energy services. It is very clear that it will not be possible to meet these kinds of deficits only on the basis of increase in supply of conventional fuels.

India is probably the only country in the world which has a full-fledged ministry for renewable energy—which clearly shows the political commitment to the cause. The government has also stated its commitment by creating a financial institution – IREDA (Indian Renewable Energy Development Agency) – which grants loans for the promotion of renewable energy technologies. An energy management centre was created many years ago, which at a particular moment of time moved into the BEE (Bureau of Energy Efficiency). Apart from this, there has been a huge amount of effort in capacity building, financial institutions, curricula consultants training, and so on. Over the past few years, energy efficiency and renewables have been institutionalized through the Energy Conservation Act. The Electricity Act passed in 2003 had a provision, under which each distribution company must procure some percentage of its electricity from renewable sources. The percentage could differ from state to state and the State Electricity Regulatory Commission decided on that. This had led to a rapid growth in the use of renewables.

Coming to the issue of commercial buildings in India, because of the phenomenal growth in the services sector, buildings with high level of amenities are being built. These are constructed and designed as if they were in Europe or the US, with materials such as glass and steel. Such buildings absorb a huge amount of solar energy in the hot Indian climate and then require a huge amount of electricity to cool them. This shows a lack of sensible design options. Hence, there is a need to evolve MEPS (minimum energy performance standards) for notified equipment and appliances, prohibit manufacture, sale and import of equipment and appliances not conforming to MEPS, and introduce energy labelling to enable consumers to make informed choices. The BEE has come out with an energy-conservation building code, of which the draft is out and comments have been received.

In the industrial sector, a real problem is the bandwidth of energy efficiency. The most efficient cement plant in the world, the most efficient refinery, and the second most efficient fertilizer plant are all in India, but the least efficient cement plant in the world is also in India. The key ongoing challenge is to see how the efficient plants pull up the inefficient ones.

Because of the Electricity Act, there has been a great increase in renewables connected to the grid, particularly wind. India is already at 6200 MW or 6300 MW of wind power, making it the fourth largest wind energy producer in the world. Today, electricity from renewables such as wind and small hydro produce more electricity in kilowatt hours than all nuclear power plants put together. However, decentralization of renewables has not occurred as efficiently as it should have, though the potential is huge. To conclude, India has been doing a lot of exciting things to monitor energy use in high energy-consuming units and to promote energy efficiency and clean energy.

### *Session 2 summary*

The main issues that emerged from Session 2 have been summarized below.

- Both India and China face the challenges of bridging their growing demand–supply gap while ensuring security of energy supply and minimizing environmental damage.
  - There is a lot of potential, if both China and India cooperate, to increase energy efficiency, and at the same time, reduce GHG emissions, which can be a co-benefit.
  - Increase in the share of nuclear energy in India’s energy mix is desirable to minimize stress on global fuel resources.
  - It is a real challenge to provide access to clean energy at affordable prices to all in the country.
  - In order to limit energy import dependence in percentage terms at about the current level, nuclear power must contribute about a quarter of the total electric power required by the middle of century.
  - Every country and every responsible private sector company needs to choose its own way of addressing the world’s energy challenges and the management of CO<sub>2</sub> emissions.
  - Governments should set very clear targets for emissions trading and other related policies beyond 2012, which will provide greater certainty and a more stable investment climate to enable the private sector to deliver on the required solutions.
- The priority programmes in China for better energy management up to the year 2020 are energy-saving technologies, clean coal technologies, oil security supporting systems technologies, advanced nuclear energy technologies, and technologies of large-scale deployment of renewable energy facilities.
  - China is also planning to establish some CDM funds to raise public awareness and support capacity building on climate change.
  - Developing countries will need to indigenously develop/adapt technologies to suit their unique requirements such as catering to the needs of the small-scale industrial sector or the development of decentralized energy options in rural areas.
  - In order to plan energy use in a proper manner for commercial purposes, India must try and evolve minimum energy performance standards for notified equipment and appliances; prohibit manufacture, sale and import of equipment and appliances not conforming to MEPS; and introduce energy labelling to enable consumers to make informed choices.

### Conclusion

The basic objective of the ‘Energy and Climate’ workshop was to focus on the interlinkages between energy and climate, with a view to exploring ways in which the twin concerns on securing energy and at the same time meeting climate and other environment-related concerns could be addressed. To that extent, the workshop was highly successful, since valuable experiences were shared on these issues. The workshop was also highly participatory. Active participation from the dignitaries truly made the energy and climate community come together. The participants included representatives from international organizations; multilateral, bilateral, and national organizations; government officials and policy-makers; representatives from energy industries; and researchers and students. It was felt that countries all over the world were now becoming increasingly concerned and proactive about the security of energy supply, reduction of energy import bills, promotion of renewable energy and energy efficiency, and climate policies.