CLIMATE CHANGE AND ENERGY

The Russian potential of energy efficiency and renewable energy, the Kyoto Protocol and Russian responses from governmental and non-governmental organisations

Published by ECO-Accord, Moscow, and Forum for Energy and Development, Denmark.
August 2001

LIST OF CONTENT

INTRODUCTION

Month after month, the international negotiations on global warming issues, especially with respect to ratification and subsequent implementation of the Kyoto Protocol, has become more and more complicated and entangled. Non-governmental organisations, seeking implementation of real actions to mitigate climate change impacts and reduce emissions of greenhouse gases, need to have a clear picture of the international negotiations and to understand positions of different involved countries and organisations.

Besides that, it is important to know sound scientific evidence of the climate change phenomena and priority actions that should be implemented to reduce emissions of greenhouse gases. The range of the latter actions incorporate *inter alia* improvements in the sphere of energy efficiency and energy conservation, use of renewable sources of energy, e.g. solar power, wind power, biomass fuel, and hydropower.

Russia is known to have the highest potential in the World of energy efficiency and renewable energy. Energy conservation potential of the country amounts to about 40% of the national energy consumption. If used, the potential might additionally increase the country's quota of greenhouse gases emissions.

Unfortunately, it is often hard for a Russian reader to find information on climate change and its dependence of energy industry practices. Naturally enough, authors of this publication do not pretend to provide a comprehensive review of all interrelations between the global warming and energy. However, the publication is intended to form a bridgehead:

- for further public awareness raising efforts among the general public at the national and international levels, and
- for dissemination of information on prospects of the Russian energy industry, potential options of use of renewable sources of energy and the potential role of the country in implementation of flexibility mechanisms of Kyoto Protocol.

The publication begins with a brief review of research findings of the Intergovernmental Panel on Climate Change. The review is followed by major provisions of the United Nations Framework Convention of Climate Change and flexibility mechanisms of Kyoto Protocol. Special attention is paid to additional potential benefits for countries, associated with their participation in implementation of flexibility mechanisms of Kyoto Protocol.

Then, the publication focuses on the energy efficiency situation in Russia and provides review of the Energy Strategy that forms the base of modern energy policy of the country. The review contains some success stories in the sphere of energy efficiency and renewable energy in Denmark. A separate chapter is dedicated to analysis of potential capacity of renewable energy sources of Russia, based on independent expert assessments.

The final section of the brochure is dedicated to views of Russian NGOs - participants of the seminar "Climate Change Mitigation Actions: NGO Position in the Sphere of Energy Efficiency and Renewable Energy" held in Moscow, in June 2001. The seminar was initiated by Eco-Accord Centre (Russia) and the Forum for Energy and Development (Denmark). The results of the seminar and the follow up action plan of non-governmental organisations are presented. They are intended to address future problems associated with the climate change.

The publication was developed with support of Danish organisation "Outdoor Council for countries of Central and East Europe". Authors of the publication highly appreciate the support

provided - it allowed us to develop this publication, to organise the above-mentioned seminar and to produce a short TV documentary on energy efficiency problems.

Major contributions into development of information materials for the brochure were made by: A.A. Averchenkov (the Centre for Development and Implementation of International Projects on Technical Assistance), V. Berdin (the Centre for Development and Implementation of International Projects on Technical Assistance), A. Bedritsky (the State Committee for Hydrometeorology), V. Chuprov (GreenPeace), D. Dudek ("Nature Protection" NGO), T. Fangel (the Danish Energy Agency), I. Gritsevich (the Centre for Energy Efficiency), V. Gavrilov (the Ministry for Economic Development and Trade of the Russian Federation), Yu. Izrael (the Institute of Global Climate and Ecology of the State Committee for Hydrometeorology and the Russian Academy of Sciences), A.Khanikov (Energy Carbon Fund of "United Energy System of Russia" JS Co.), L. Kulikovskaya (Petrozavodsk State University), M. Martynova (Energy Carbon Fund of "United Energy System of Russia" JS Co.), L. Maksimiuk (the Institute of Global Problems of Energy Efficiency and Ecology), I. Mazurin (Moscow Energy Institute), J. Nordbo ("Group 92" - Danish NGO group), A. Mastepanov (the Ministry of Power Industry of the Russian Federation), S. Roginko (the Institute of Europe of the Russian Academy of Sciences), V. Shalimov (Socio-Economic Union, Volgodonsk Affiliate), M.Yulkin (the Centre for Environmental Investments of Arkhangelsk Oblast).

The views, opinions and findings presented by the authors do not necessarily reflect the views, opinions, and finding of the editors or of their organisations.

Electronic versions of the publication (English and Russian texts) can be found in the Internet at web-sites of Eco-Accord Centre http://accord.cis.lead.org, and Danish NGO "Forum for Energy and Development": www.energiudvikling.dk

Hard copies can be obtained on request from:
Eco-Accord Centre (phone: +7095-925-9282, fax: +7095-220-0059, or e-mail accord@ntserver.cis.lead.org; speransk@ntserver.cis.lead.org).

and

Forum for Energy and Development, Blegdamsvej 4B, DK-2200 Copenhagen N, ph+45-35247700, email ove@inforse.org.

Project co-ordinators/editors:
Olga Speranskaya
Eco-Accord Centre

Gunar Boye Olesen
Forum for Energy and Development

THE GLOBAL CLIMATE CHANGE HAS BEEN PROVEN BY SOLID SCIENTIFIC FACTS

By Olga Speranskaya and Gunnar Boye Olesen

In early 2001, the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) was published. The report contains proven scientific facts of global warming and provides an objective review of observed changes of the climate system and underlying factors, that generate these changes.

Global warming is associated with substantial, maybe even disastrous consequences for the natural environment and the humankind. The problem is of global significance; it affects all countries and regions. The nature of the climate change is defined by both the natural phenomena and anthropogenic factors - i.e. greenhouse gases emissions.

The third IPCC Assessment Report was developed by 123 authors. Materials for the report were provided by more than 500 experts, more than 300 experts developed comments and proposals for the report, that were incorporated into the final version. Besides that Assessment Report itself, Summaries for Policymakers were published..

The climate change has been proven

The First IPCC Working Group has proven that the climate changes and becomes warmer. In 20th century average surface temperatures increased by 0.6°C. 20th century seems to be the warmest century of the last millennium, while 1990s seem to the warmest decade of the last millennium.

According to satellite observations, since late 1960s, the snow cover area decreases by about 10%. Lake and river ice seasons became shorter (by about 2 weeks) at medium and high latitudes of the Northern Hemisphere. Decrease of mountainous glaciers was observed in all non-polar regions. The area of sea ice in spring and summer periods in the Northern Hemisphere decreased almost by 10-15%. In late summer - early autumn periods, sea ice thickness decreased by 40%.

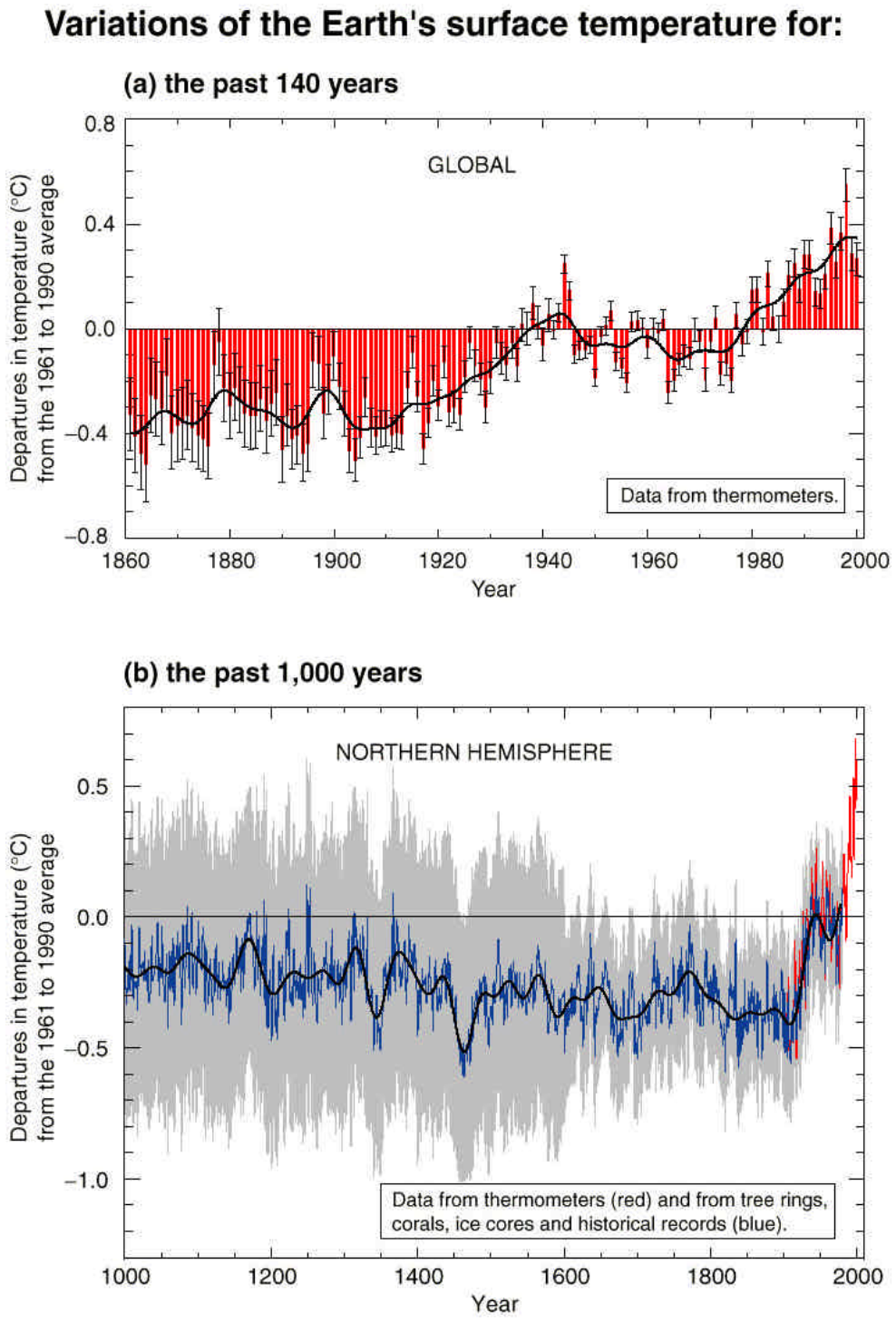
In 20th century, average sea level increase reached 0.1 - 0.2m. In the majority of middle and high latitude regions of the Northern Hemisphere, atmosphere precipitation increased by 0.5-1%.

In the last decade, in some regions of Africa and Asia, the frequency and intensity of drought have been observed to increase. Since 1950s, warm El-Nino events became more frequent, stable and intensive.

Causes of the climate change

Responses of the climate system to anthropogenic impacts are masked by natural climate fluctuations, ranging from a few weeks to several ages. All computer simulations, based on global climate models, accounting for observed growth of concentrations of greenhouse gases and aerosols, suggest a major contribution of anthropogenic factors into changes of surface temperatures in the last four decades.

It is absolutely clear that warming of the last 50 years cannot be attributed to natural changes only, however, it may be well described by joint impacts of anthropogenic and natural factors.



To a rather substantial extent, the climate change may be attributed to growing releases of greenhouse gases. Let us remind, that the key greenhouse gases incorporate CO_2, methane, nitrogen oxides and some artificial gases (e.g. freons). Concentrations of all greenhouse gases continue to grow rapidly, today's concentration of carbon dioxide is higher than in any period of time in recent 420000 years, maybe even higher than in any time of the last 20 million years. For

example, according to IPCC, comparatively to 1750, in 2000, atmosphere concentrations of carbon dioxide increased by 31%. In two past decades, CO_2 concentrations in the atmosphere increased by about 0.4% annually. In 1990s, concentrations of CO_2 increased by 0.2-0.8% annually.

About 3/4 of all anthropogenic emissions of carbon dioxide in the last 20 years were caused by burning of fossil fuel. Other emissions were associated with industrial processes, land use changes and (especially) with deforestation. According to IPCC report, about a half of all anthropogenic emissions of carbon dioxide are adsorbed by the ocean and land surface.

People continue to endanger the global climate and themselves

Anthropogenic impacts will continue to affect the atmosphere and the Earth climate in 21st century. According to expert assessments, if no measures will be taken to reduce emissions of CO_2 and other greenhouse gases, in the period from 1990 to 2100, average surface temperatures would increase by 1.5-1.8°C, while in the Northern Hemisphere the temperature increase would be even higher.

It is fairly probable, that the temperature increase will result in rise of the sea level by about 40cm (a rough estimate), in higher frequency of storms and other natural disasters, e.g. rainstorms that might flood large land areas. Polar caps and mountainous glaciers would decrease, except in Antarctica. In Arctic regions (Siberia, Alaska, etc.) permafrost-melting process would start. All these phenomena might further aggravate the greenhouse effect.

In subsequent centuries, climate changes would continue, and if we fail to reduce the role of anthropogenic factors in the process, consequences of the global warming might be substantially graver. The sea level might increase by up to 3 metres, as a result, the Gulf Stream might disappear.

According to the Second Working Group of IPCC, some particular ecosystems are especially vulnerable to impacts of the climate change. Some of them may be completely destroyed, including coral reefs, boreal forest and tropical rainforest, steppe marches and natural grasslands.

According to data of the Assessment Report, at large areas of Eastern Europe, in the European part of Russia, Central Canada, and California, the far larger share of precipitation falls now in the form of rain, not in the form of snow. In the recent decade, 67% reduction of glaciers was observed in Himalayas and Tiang-Shan mountains. About a half of all glaciers in Alps are under the threat of extinction.

Witnesses' reports

The group of experts of Canadian Institute of Prospective Development worked for a year in Sax-Harbour (a township at Banke Island, within the Polar circle) and produced a documentary on their experience. In the documentary, the township residents complain, that the ice is getting thin and fractured, icebergs disappear, and the sea steadily retreats. Polar bears are seen at the island more and more rarely, seals prefer to stay in the open sea, because there are no ice blocks nearby the coast any more, where seals rest. Hunting and fishing became a risky business, traditional food becomes extinct. Houses that were constructed at the frozen soil become settling, their doorways, and windows deform.

Old residents of Sax-Harbour remember, that in their young years, they used to arrange dogcart races at the ice in June. Today, in June, young residents of the island go to the sea in boats.

The warming affects the health of the Eskimos as well. More intensive solar radiation results in higher incidence of skin diseases. Canadian Eskimos are losing the base of their traditional culture. Many of them are inclined to quit Sax-Harbour, arguing that their township has no future.

Similar trends will continue for the whole 21st century and later on. In some regions of Africa, frequency and intensity of droughts will increase due to reduction of precipitation. In many Asian countries, growing intensity of tropic cyclones and rising sea levels will result in flooding of large areas of cultivated land, causing problems of food supply. Serious problems of drinking water shortage will affect Australia and New Zealand, due to longer dry seasons. In Europe, a large part of the continent will become prone to water floods. In Latin America, higher incidence of both floods and droughts will be observed. In North America, rising sea level will intensify soil erosion in coastal areas. Higher risks of storms will be observed in Florida and along the whole Atlantic coast of the America.

The climate change will result in serious adverse impacts on human activities. The global warming will result in reduction of crop yields at the territories located in the majority of tropic, sub tropic and middle latitudes, in higher frequency of floods, shortages of drinking water, in spread of diseases (including cholera and malaria).

A country's capacity to adapt to the climate change depends on its economic potential. Naturally, the poorest developing countries are among the most vulnerable ones. They have the right to demand from industrialised countries, which are responsible for the bulk of greenhouse gases emissions, to implement decisive measures for reduction of adverse consequences of the climate change.

Mr. Klaus Topfer, the Executive Director of UNEP, believes, that it is absolutely necessary to realise the serious consequences of economic development of industrialised countries and to foresee them. It is important to protect the most vulnerable ecosystems, trying to adapt them to new climate conditions. Mr. Klaus Topfer believes, that even now, national governments have to account for the new circumstances in their long-term planning of national economic development.

Options for reduction of GHG emissions

The Third IPCC Working Group assessed options for abatement of adverse impact of the climate change, focusing mainly on reduction of anthropogenic emissions of greenhouse gases. The range of the most important options was found to incorporate: higher energy efficiency, efficient use of natural gas, use of fuel of low carbon contents (e.g. biomass fuels) and use of renewable sources of energy. Experts think, that application of a mix of these measures may result by 2020 in annual reduction of GHG emissions by 3.6-5 billion tons of carbon equivalent (or about 43 - 60% of contemporary GHG emissions).

Additional information:
See also: IPCC summaries for policy-makers and technical summaries at www.ipcc.ch (in the English language).

See NGO analysis of the greenhouse effect and required climate policies at www.climnet.org (in the English language)

See NGO views on sustainable power industry, that should result in limitation of global temperature changes within 1°C at www.inforse.org (in the English language).

FRAMEWORK UN CONVENTION ON CLIMATE CHANGE: major provisions

By Olga Speranskaya

United Nations Framework Convention on Climate Change (UNFCCC) was agreed on May 9, 1992 and entered into force on March 21, 1994. As for the time being, the range of Parties of the Convention incorporates 186 countries, including all developed countries and CIS countries. The Convention calls for joint efforts to prevent dangerous climate changes and to ensure stabilisation of concentrations of greenhouse gases in the atmosphere at a relatively safe level. At the first Conference of the Parties (COP-1) of UNFCCC, which was held in Berlin in 1995, the international community decided to launch phased actions for reduction of GHG emissions to the atmosphere and develop a relevant system of environmental and economic relations.

UNFCCC Parties should implement national policies and actions for reduction and limitation of GHG emissions. The Convention does not stipulate strict international regulation of these national activities. According to the principle of "common, but differentiated responsibility", declared by the Convention, every Party has the right to define its priorities and actions independently.

UNFCCC was ratified by a relevant Law of the Russian Federation in 1994. Having ratified the Convention, the Russian Federation made the following commitments:

- *to submit periodically National Reports, containing information on all actions and measures, being implemented in the country in the following spheres: inventories of anthropogenic emissions of greenhouse gases; development and implementation of measures for reduction of GHG emissions; assessments of impacts of climate change on ecosystems and socio-economic conditions; scientific research and dissemination of information on climate change among the general public;*
- *to provide data of the national annual inventories of anthropogenic GHG emissions by sources and adsorption of GHG by sinks to Parties of UNFCCC;*
- *to develop and implement national programs, facilitating implementation of policies and measures for reduction of GHG emissions;*
- *to provide to the Parties scientific and technical information on research in the sphere of climate and best practices of adaptation for the climate change;*
- *to fulfil finance commitments, associated with contributions into the regular budget of UNFCCC*

According to A.I. Bedritsky, the Chairman of the State Committee for Hydrometeorology, assessments of reduction of GHG emissions in Russia have revealed, that if we account for Russian commitments under Kyoto Protocol, allowing annual emissions of 3 039 Mt CO_2 (the emission level of the base year - 1990), in 10 recent years Russia has collected overall emission "savings" of about 7600 Mt of greenhouses gases emissions in CO_2 equivalent (or about 760 million tons annually). These positive developments cannot be attributed to production decline only, these results are also associated with purposeful restructuring of the national economy, reduction of the share of energy intensive industries, conversion of the military-industrial complex and implementation of energy efficient and energy saving technologies.

Kyoto Protocol

In December 1997, in Kyoto in Japan, at the Third Conference of Parties of UNFCCC, the "Kyoto" Protocol to UNFCCC was approved. It specified quantitative targets of limitation and reduction of anthropogenic GHG emissions for developed countries and economies in transition (as listed in Annex B to Kyoto Protocol). The Parties of Kyoto Protocol committed themselves to prevent GHG emissions in excess of their respective allowed emission quotas.

For the time being, the Protocol has been signed by 84 countries, including all developed countries and almost all CIS countries. Russia signed the Protocol on March 11, 1999. Now, the Protocol has been ratified by 33 countries, including Mexico, Romania, Uzbekistan, Georgia, Azerbaijan, Turkmenia and Mongolia. (Romania belongs to countries of Annex B).

The Protocol will enter into force only if ratified by 55 countries (moreover, the list of these countries should incorporate the ones, responsible for 55% of net CO_2 emissions of developed countries and economies in transition in 1990). The share of Russian emissions of carbon dioxide reaches about 17%. It is clear, that if USA and Russia fail to ratify the Protocol, it will never enter into force. (See Table 1 for the list of countries that have to ratify Kyoto Protocol). Such an option will result in the need to develop a new document.

Table 1: Greenhouse gases emissions in countries of Annex B of Kyoto Protocol.

Countries or country groups	%	Cumulative %
EU (incl. Norway and Switzerland)	25.0	25.0
Eastern Europe excl. Russia	7.4	32.4
Japan	8.5	40.9
Russia	17.4	58.3
Australia and New Zealand	2.3	60.6
Canada	3.3	63.9
USA	36.1	100

According to Kyoto Protocol, developed countries and economies in transition - Parties of the Protocol - are obliged to reduce their emissions of greenhouse gases not less than by 5% in average (comparatively to levels of 1990) by 2008-2012. Specific reduction targets differ - for example, USA, Japan and EU countries are obliged to reach reduction of GHG emissions by 7%, 6% and 8% respectively (average figures for the period of time between 2008 and 2012), comparatively to their emission levels in 1990. Russia managed to take comparatively "soft" commitments - the country will not be obliged to reduce national GHG emissions below the level of 1990, however, Russia will not be able to exceed these levels (averages for 5 years, from 2008 to 2012 inclusive). Ukraine made similar commitments (see Article 3 and Annex B of Kyoto Protocol).

Norway, Australia, and Iceland were permitted to increase their GHG emissions. There is some internal redistribution of emission limitation/reduction commitments within the European Union - Germany and Denmark are obliged to reduce their emission by 21%, while commitments of France and Finland are similar to the Russian ones, and Portugal, Greece, and Ireland were granted permission to increase their GHG emissions. The above redistribution is some sort of internal "trading in emission quotas" at the level of governments of EU member-states (though no financial transfers occur).

The problem of global climate change necessitates development of efficient economic and environmental tools for regulation of greenhouse-gas emissions both globally and nationally. Efficiency of individual tools depends on particular institutional features of a given country, its environmental problems, and many other factors. Therefore, Kyoto Protocol imposes no limitations on national policies for regulation of GHG emissions. The key principle of the Protocol is associated with provisions for some "flexible" mechanisms of international co-operation, allowing fulfilling national commitments for reduction of GHG emissions:

1) *Joint implementation projects* for reduction of greenhouse gases emissions. Implementation of these projects results in transfer of emission-quotas to foreign investors (reduction of GHG emissions due to implementation of joint projects).

2) *Clean development mechanism* stipulates accounting for GHG emission reductions in developing countries as an additional quota for developed countries.

3) Trading in GHG emission quotas stipulates the option of assignment of quotas between countries, that have made commitments to reduce their GHG emissions. If a country has committed to avoid exceeding some definite level of average GHG emissions in 2008-2012, the country is understood to have some national GHG emission quota - i.e. a permission to emit an amount equal to the country's commitments. Thus, the Russian quota is equal to its emissions of 1990. If a country does not reach its emission quota (i.e. if the country "over-fulfils" its commitments), the country can transfer or sell its "free" part of the national quota to some other country.

4) *Joint fulfilment of commitments* - using this mechanism, a group of countries can redistribute GHG emission quotas between participating states in order to reach their collective emission reduction targets.

Therefore, the Kyoto Protocol is the first international agreement that applies a market-based mechanism as an approach for addressing global environmental problems.

ADDITIONAL BENEFITS, ASSOCIATED WITH REDUCTION OF GREENHOUSE-GAS EMISSIONS

E.Strukova, the Council for Study of Productive Forces of the Russian Academy of Sciences

Emissions of greenhouse gases accompany almost all human activities and may be considered as a some sort of "a business card" of a national economy. Higher emissions of greenhouse gases per unit of output usually reflect lower efficiency of a national economy. High emissions of CO_2 per unit of output suggest high consumption of fossil fuel and low efficiency of its use. In their turn, higher emissions of greenhouse gases are accompanied by higher emissions of particulate matter, sulphur dioxide, nitrogen oxides, etc. Therefore, measures to reduce GHG emission allow a society to improve economic efficiency and reduce environmental loads. Several years ago, a relevant analysis was made for Russia and allowed to identify a sphere, where environmental protection and economic development interests do not contradict and even are mutually supportive.

What would Russia gain if the country will undertake serious measures to reduce emissions of CO_2 and other greenhouse gases?

Application of flexibility mechanisms of Kyoto Protocol ensures fulfilment of national commitments for reduction of GHG emissions and allows to reduce costs of reaching national emission targets. Countries become more interested in negotiations on global warming matters. Countries will participate in international agreements, that impose limitations for their freedom of choice in economic matters, only if their participation will provide them some benefits at the national level. Implementation of mechanisms of Kyoto Protocol will facilitate reduction of GHG emissions, introduction of new technologies and ensure more efficient international co-operation.

At the macro-economic level, additional economic benefits of trading in emission quotas incorporate direct and indirect benefits. These benefits may be ranked as follows:

Direct economic benefits:

- Search for efficient options for reduction of GHG emissions;
- Actual reductions in excess of emission reduction targets;
- Mobilisation of additional financial resources for efficient measures to reach emission targets;
- Generation of a new source of investment capital for a seller at a market with short supply of investments;
- Higher changes for ratification of Kyoto Protocol.

Indirect economic benefits:

- New incentives for market capital in the sector of reduction of GHG emissions. So far, the sector was outside the sphere of interests of economic actors;
- Improvement of reporting in the sphere of emissions' registration;
- Reduction of transaction costs;
- Reduction of operational and administrative costs.

From the point of view of general market infrastructure, importance of the new market sector can be hardly overestimated. Usually, in the case of a reliable capital market, loan-based financing of a project is far more advantageous, than financing from own funds of an implementing agency. This mechanism was broadly used in the West in 15 recent years. In this case, a project may be financed from future profits, without additional finance injections. As a result, the project becomes financially sustainable in the long-term future. Similar projects (with use of investment capital) are valued very high in the World. Projects for reduction of emissions of greenhouse gases, potentially

also may become very attractive for loaning organisations.

The reason is associated with high returns on investment for investors, who risked to invest their money into a project of that sort. If investors will make efforts for development, management and implementation of these projects, it will be a major contribution into development of an economy in transition, where professional actors at the capital market are usually of short supply. Besides that, they may also provide loans or even co-funding, expecting future profits.

Usually, in developed countries, the ratio of loans to a project's own funds is about 4:1. In the case of economies in transition, the share of loans is expected to be lower. However, even in the latter case, one dollar at a guaranteed market of emission quotas would generate 3-4 dollars of additional investments. Long-term contracts would pave the legislative way for more passive investors and borrowers, facilitating their participation of financing of projects. They would expect stable, long-term profits from a project implementation for 10 - 30 years, thus facilitating development of long-term financing/borrowing for comparatively low collateral. Therefore, internal features of a market for trading in GHG emission quotas, stipulating funding of relevant projects, create additional preconditions for development of modern capital markets. This is very important for economic development of the country. These additional benefits would induce the newly emerging class of Russian businessmen to become interested in trading in GHG emission quotas and to participate in development of the market.

Therefore, businesses have many incentives to become involved into exploring carbon potential of economies in transition. Energy conservation, allowing to reduce operational costs, belongs to them as well. We inherited a huge capacity for reduction of GHG emissions from the central planning epoch. For example, in Russia, available capacity of technological options for energy efficiency and energy conservation is utilised to a very small extent (energy conservation capacity of the country reaches now about 40% of gross national power generation, while in EU member-countries, Japan and other developed countries available energy conservation capacity has been almost exhausted). As a result, it is far easier to identify and implement an emission reduction project in Russia, than in the majority of developed countries.

Russia, as well as other countries with energy-intensive economies, is vitally interested in reduction of operational costs and restructuring of the national industrial base. Now, Russia spends about $450 million for energy conservation purposes. However, investment resources are in short supply, there are no funds even for potentially profitable projects. Projects for reduction of GHG emissions would develop a necessary investment climate, attract additional foreign consumers and create preconditions for transfer of modern technologies, reduction of trade barriers and free information exchange. In other words, a new market for energy-efficient goods and services would develop.

Implementation of projects for reduction of GHG emissions with subsequent re-investment of generated profits may be considered as an alternative option for deployment of "dirty" production facilities at the territory of Russia. Therefore, besides addressing current environmental problems, improvement of production efficiency and development of preconditions for sustainable forestry, the necessary base will be also created for prevention of growth of GHG emissions in the future.

Additional environmental benefits from implementation of projects for reduction of GHG emissions.

The most important environmental benefits, that might be generated by Russia's participation in trading in GHG emission quotas, incorporate the following ones:

- Public health benefits;

- Reduction of adverse impacts of acid rains;
- Support of sustainable forestry.

One can hardly validate these benefits in monetary terms. However, these benefits make reduction of GHG emissions important for those, who are interested in environmental improvement of Russia.

Additional public health benefits

Major public health benefits, generated by implementation of projects for reduction of GHG emissions, are associated with corresponding reduction of emissions of local pollutants. Among them, reduction of aerosol emissions are considered as the most important factor. Solid airborne particles of less than 10 micrometers in diameter pose especially serious threats to human health (PM10). Besides acute respiratory diseases and asthma, these emissions may induce cancer (at long-term exposures). At the same time, emissions of PM10 per unit of output in economies in transition substantially exceed relevant figures of developed countries. Therefore, reduction of PM10 emissions is an important public health issue per se. Typically, the share of PM10 reaches about 0.6 of gross emissions of particulates, referred to in official statistical reports. It is important to stress, that similar approaches might be applied to other local pollutants, that cause adverse health impacts, e.g. NOx, SO_2, etc. However, in the case of PM10, all these trends are especially visible, because epidemiological studies have identified and clearly confirmed their adverse health impacts.

We used information on extra mortality, associated with PM10 emissions in Russian cities. Analysis of PM10 emission in more than 100 cities of Russia in 1975 - 1991 reveals that annual extra mortality, caused by PM10 emissions, amounted to 16,100 extra death cases per annum. We used the figure as a baseline of PM10-caused death risks in 1990. Then, additional reduction of CO_2 emissions would be accompanied by relevant reduction of PM10 emissions. Let us estimate the number of death cases avoided, using the linear dependence between extra mortality risks and PM10 emissions. The assumption is rather rough, it may be applied only for average estimates for Russia as a whole (assuming also, that there is no impact threshold for PM10 contamination).

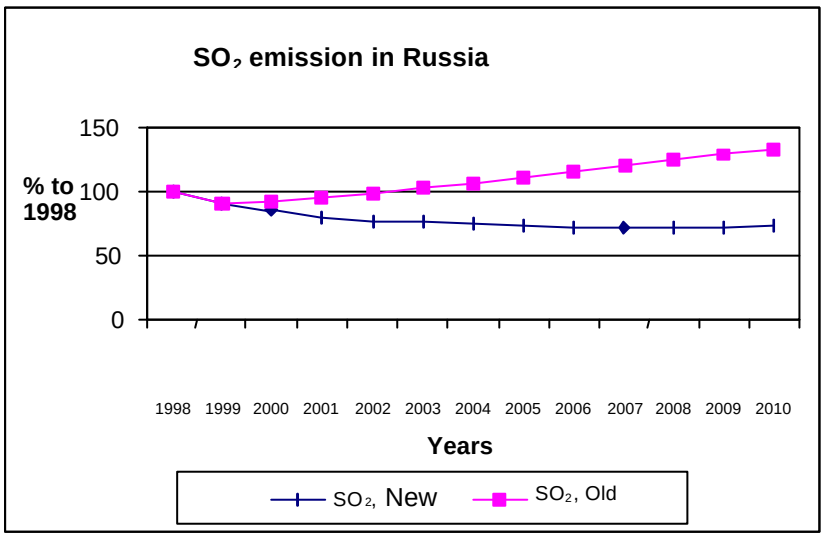
Based on a computer simulation with application of a dynamic model of GHG emissions, we may estimate that re-investment of proceeds from trading in emission quotas into emission reduction projects would result in corresponding reduction of PM10 emissions. The linear correlation between PM10 emissions and population health risks allows us to estimate annual reduction of extra mortality as: N = X% *16100. Here, N = estimated reduction of extra mortality, attributed to environmental pollution by solid particles less than 10 micrometers in diameter; X = additional reduction of PM10 emissions, relatively to their emissions in 1990 (%). The dynamics of PM10 emissions in Russia for two scenarios were analyzed (economic development based on use of old respeictively new technologies). In the case of prevalence of old technologies, extra mortality, attributed to PM10 emissions, would be 2.5 times higher than in the case of implementation of new technologies. This means about 10000 additional death cases per annum by 2010. Re-investment of proceeds from trading in emission quotas into projects for reduction of GHG emissions would allow us to reduce extra mortality and morbidity levels substantially.

The earlier we manage to implement flexible mechanisms of Kyoto Protocol and reinvest proceeds into projects for GHG emissions reduction, the higher public health benefits we will get by the end of the first budget period (due to higher reduction of PM10 emissions and associated extra mortality). It is necessary to remember, that reduction of GHG emissions will be accompanied by reduction of emissions of other pollutants, that also provoke excessive mortality and morbidity.

Reduction of acid rains' impacts

Impacts of acidic compounds in their different forms result in irreversible environmental changes. Major acidic agents of the above category include nitrogen and sulphur dioxides. Russia itself is responsible for the bulk of acid precipitation at the territory of the country (due to geographic location of the country and location of major industrial polluters). Impacts of acid rains may vary - from complete destruction of an ecosystem (a technological dessert) to initial stages of ecosystem destruction. The impacts mainly manifest themselves by decreasing rates of growth of coniferous trees (or by a complete lack of growth) and by disappearance of fish in water bodies.

The major sources of acid pollution include thermal power plants, metallurgic plants and agriculture facilities. Implementation of flexibility mechanisms of Kyoto Protocol and subsequent reinvestment of proceeds into energy efficiency would result in reduction of SO_2 and NOx emissions. The figure below shows forecasts of SO_2 emissions in Russia for application of new and old production technologies (the estimates are based on the same balance model, as in the case of PM10 emissions). It is clear, that lower SO_2 emissions in the case of application of new technologies would result in substantial reduction of acid rains and comparative improvement of ecosystems.



In the case of development at the base of new technologies (SO_2 New), acid rains' impacts on ecosystems of Russia would be reduced twice (at least) by 2010, comparatively to the pessimistic scenario (SO_2 Old).

ENERGY STRATEGY OF RUSSIA: MECHANISMS OF KYOTO PROTOCOL AND ENERGY EFFICIENCY

O. Pluzhnikow, the Ministry of Power Industry of the Russian Federation

According to the Second National Report of the Russian Federation, 98.6% of anthropogenic emissions of carbon dioxide are associated with burning of fossil fuel. If we account for the fact that the share of CO_2 in net equivalent GHG emissions reaches 77%, it becomes absolutely clear, that in the foreseeable future, it will be development of power industry of Russia that will play a decisive role in meeting Russian commitments for reduction of greenhouse gases emissions.

According to estimates of the Ministry of Power Industry, in the period from 1990 to 2000, reduction of CO_2 emissions by power plants of Russia reached about 33%, however, in 2 recent years, a minor increase of emissions was registered. The increase was caused by growth of internal use of coal (7.6%), oil and oil products (8.3%).

Energy policy of the Russian Federation will be defined by the Energy Strategy, approved by the Government in November 2000.

The Strategy is based on the assumption of 5-6% annual growth rates of the national economy. As a result, by 2020, GDP of the country is expected to increase 3-fold. In order to provide power supply base for the growth, the following objectives should be met:

1. to ensure growth rates of energy efficiency of the national economy at the level of 4-5% per annum (three-fold GDP growth cannot be accompanied by a corresponding increase of energy consumption);
2. to ensure growth of production of primary energy resources (oil, natural gas and coal) and use of renewable energy. The production growth should cover increase of domestic energy consumption and maintain necessary levels of fuel and energy exports. While growing domestic consumption might be met by higher energy efficiency, the growth of the export should be guaranteed for the whole period of time considered.

Mechanisms of Kyoto Protocol serve as a major tool for mobilisation of investments, first of all - for mobilisation of investments into energy efficiency improvement. We are ready to propose different energy efficiency projects, focusing at this sphere in the course of our dialogue with EU member-countries.

Besides that, Russia will intensify production of natural gas. Natural gas it the most clean fuel and demand for it will continue to grow. Russia has sufficient reserves of natural gas and we plan to attract investments into its production and export.

According to the Energy Strategy, within the period of time up to 2020 (i.e. the period of commitments), Russia would never exceed the emission level of 1990, regardless a particular development scenario from the range of stipulated ones. Even in the case of scenario of high economic growth, emissions of CO_2 by power industry facilities of Russia in 2010 would reach only 80% of the baseline emission level (1990), reaching about 95% of the baseline figure by 2020. The high growth scenario stipulates 5% - 6% economic growth and maximal utilisation of energy conservation potential of the country (rough estimates suggest, that the energy conservation potential reaches about 1/3 of gross national energy consumption).

Table 1. Dynamics of CO_2 emissions by power industry facilities of Russia (Energy Strategy-2020)

	1990	2000	2005	2010	2015	2020
CO_2 emissions, million tons *High growth scenario*	2 326	1 610	1 750	1 870	2 000	2 200
CO_2 emissions, million tons *Lower growth scenario*	2 326	1 610	1 700	1 750	1 800	1 840

There are different forecasts of CO_2 emissions in Russia. For example, according to the latest forecast of the High School of Economics and US Environmental Defence, in the case of economic development without application of substantial incentives for energy conservation and reduction of GHG emissions, Russia would use about 93% of the national emission quota.
Therefore, the country would be able to propose to the international market not more than 1 billion tons of CO_2. In this case Russia would reach the level of 1990 by 2012.

From the other hand, if the country will apply incentives for energy conservation and mobilise large-scale investments into emission reduction (starting from 2004, at the latest), Russia would use 80% of the national quota and would be able to sell 3 billion tons of CO_2).

Official Russian reports on carbon dioxide emission in the base year (1990) suggest figure of 3,039 billion tons of CO_2 equivalent. Accounting for 5 years, allocated for fulfilment of commitments under Kyoto Protocol and the Russian target of 100% of the base year level, we may estimate the overall national quota for emissions of CO_2 is equal 15,195 billion tons of CO_2 equivalent for 5 years.

G. Safonov, the High School of Economics

According to assessments of the Ministry of Power Industry of Russia, large-scale implementation of organisational and technological measures for energy conservation would allow to reduce power consumption by 360 - 430 million tons of equivalent fuel annually. About a third of all energy conservation capacity belongs to power industry facilities. Another third is shared by other production and construction industries, more than a quarter of the potential belongs to utilities (plus 6% - 7% of transport sector and 3% of agriculture sector).

The draft Energy Strategy of Russia is based on assumption, that up to 20% of energy conservation potential (or 70 - 85 million tons of equivalent fuel annually), might be used at unit costs lower than $15 per 1 ton of fuel equivalent (at contemporary prices of electric power and fuel).

The most expensive energy conservation measures (requiring more than $60 per 1 ton of fuel equivalent) form only 15% of the national energy conservation potential. Use of remaining two thirds of energy conservation potential would require comparatively high investments, but these investments are nevertheless lower (by 10-30%) than corresponding investments into expansion of production capacity of the power industry.

In order to apply so high energy conservation potential it would be necessary to develop business and economic preconditions, including introduction of changes into pricing processes in power sector of Russia as the key precondition.

In order to facilitate energy conservation, the Energy Strategy stipulates comparatively swift adjustment of internal fuel and electric power prices - the prices should be set at levels, ensuring

complete self-financing (including future investments) of fuel and electric power production, with their further harmonisation with the world prices.

GREEN INVESTMENTS IN RUSSIA

Kyoto Protocol is important for Russia, also for economic reasons. Russia considers EU, Japan and the USA as the major strategic partners. Outcomes of the Sixth Conference of the Parties of UN Framework Convention on Climate Change (Bonn, July 17-27, 2001) allow us to hope that Kyoto Protocol will enter into force in the nearest future. However, the Protocol would require minor technical adjustments, including introduction of the green investment scheme.

The green investment scheme stipulates economic development along the most environmentally safe path. Unprecedented growth of energy efficiency in Russia will be guaranteed by industrial reconstruction and technological modernisation. The green investment scheme stipulates a system of measures to be implemented in institutional and taxation spheres and in the national investment policies. Its major component parts include management of cash flows and investment funds and further co-ordination of the federal budget and regional budgets.

According to the scheme, a specialised fund will be established to accumulate proceeds from trading in GHG emission quotas. Later on, these resources will be used solely for projects, aimed at implementation of Kyoto Protocol. The Russian Federation could become the first country to implement the green investment scheme for mechanisms of Kyoto Protocol.

Besides that, business/economic incentives for energy conservation incorporate also tax exempts for investments, channelled into energy efficiency projects (profits tax), tax and loan preferences, introduction of other finance incentives, etc..

Within the framework of development of a system of legislative and administrative actions to promote energy efficiency, the Energy Strategy of Russia stipulates also introduction of the following measures:

- tightening of standards, rules and regulations, pertaining to use of fuel and electric power;
- improvement of rules of regulation/control of energy consumption;
- regular energy auditing of enterprises, first of all, auditing of energy intensive ones, etc.

It is fairly possible that further development of the Russian power industry will follow the above scenario, however, there is a major practical obstacle i.e. the need to mobilise substantial funds, necessary for implementation of energy conservation projects. Assessments suggest that the funds would amount to several billions of dollars, but, according to estimates of the Ministry of Power Industry of Russia, the state finance support could not exceed 3-4% of the overall financing needs.

Therefore, the search for external finance resources for energy conservation projects becomes now a fairly relevant problem. The range of potential sources of finance incorporates also application of so called Kyoto mechanisms, including joint implementation projects (under Article 6 of Kyoto Protocol) and trading in emission quotas (Article 17).

Estimates suggest that the Russian power industry alone has more than 2 billion units of CO_2 equivalent, that could be transferred to foreign investors at some conditions. In this case, the key feature is associated with the fact that all these amounts, according to forecasts of the Energy Strategy, could be transferred without endangering further economic growth of Russia. At the

same time, we are convinced, that finance resources, to be generated by transfer of emission quotas, should be used solely for energy efficiency purposes, serving thus as an additional guarantee of fulfilment of the national emission commitments. The Ministry supported and will continue to support all efforts for maximal and early introduction of Kyoto mechanisms in Russia, but for the time being there is nothing like a necessary infrastructure in Russia, even within the framework of pilot projects.

Notwithstanding that rules of implementation of joint projects have not been negotiated at the international level and Kyoto Protocol has not been entered into force, the Ministry of Power Industry of Russia and other organisations receive requests of investors from Sweden, Norway, Holland, Denmark, Germany and other countries for provision of organisational assistance in implementation of small pilot energy efficiency projects in Russia, associated with potential future transfers of units of emissions avoided. Moreover, investors themselves are often ready to bear project risks.

Unfortunately enough, we have to admit, that we are lagging behind: the absence of a well-developed and transparent system for joint implementation projects in Russia hinders their implementation. Unfortunately, in today's Russia nobody can provide meaningful answers to the following questions, defining opportunities for joint implementation projects: how does really a scheme for implementation of projects under Kyoto Protocol operate? What are the priorities of project activities? How are systems of projects' approval, verification and certification working?

It is clear, that projects within the framework of implementation of Kyoto Protocol mechanisms would be mainly focused on addressing economic and energy problems. This means that they would necessitate involvement of a diverse range of experts from the Ministry of Power Industry of the Russian Federation, the Ministry for Economic Development, the Ministry for Natural Resources, the State Committee for Hydrometeorology, and NGOs. Experts of the above institutions may facilitate development of necessary infrastructure in Russia.

CARBON MARKET: CONTEMPORARY STATUS AND DEVELOPMENT PROSPECTS

A.Golub, Environmental Defence, USA

The theory of developing markets belongs to the most complicated areas of contemporary economic science. If we add the fact, that the market commodity in question is represented by the right to use capacity of the Earth atmosphere to receive and assimilate greenhouse gases - i.e. the market relations cover the utility, which always was of free and unrestricted assess - we can easily assume that the problem's complexity increases exponentially. Nevertheless, the process of development of the carbon market is well under way, and we will try to analyse it in the current presentation. First of all, we have to admit, that (as it should be reasonably expected for a developing market), the market emerges and develops initially as a set of isolated markets. At the contemporary stage of development we can specify at least four major markets - 1) the global market; 2) regional markets; 3) national markets; 4) corporate markets of large corporations.

1. International/global carbon market

Available publications focus on analysis of the global market. Development of the global market is based on UNFCCC and Kyoto Protocol to the Convention. First, Kyoto Protocol identified institutional margins of the market, second, it distributed the commodity (i.e. emission quotas) between developed countries; and third - it defined rules for production of the commodity in developing countries and procedures of their entry to the market.

Who are sellers and buyers at the market? In order to answer this questions, let us look into Table 1 (analysis of potential supply and demand at the market). The Table was compiled, based on National Reports of countries of Annex 1 to UNFCCC, and detailed studies, conducted for Russia, Ukraine, and large CEE countries.

Table 1. Supply and demand for emission quotas at the global market

Countries	Expected emissions minus emission budgets*
USA	10 000
EU	1 500
Japan	1 000
Other developed countries (Annex2)	1 500
Russia	- 3 500**
Ukraine	-1 200
Eastern Europe	-400
Developing countries	-1000
Total	7 900

*Emission budgets are specified in Annex B to Kyoto Protocol. The column contains total differences for 5 years. Units of measure - tons of CO_2 equivalent.
** - means excess, + means shortage, i.e. countries with positive parameters in the second column belong to potential buyers, while countries with negative parameters belong to potential sellers.

Some part of the overall shortage would be covered by implementation of emission reduction measures in developed countries and some part would be covered by implementation of measures for CO_2 absorption by ecosystems. The latter measures might reduce the shortage by about 3000 million tons, reducing the remaining gap to 4900 million tons of CO_2 equivalent. Expert estimates suggest that the above reduction is fairly feasible. Different studies suggest that prices for emission quotas may vary from $10 to $25 per 1 ton of CO_2 equivalent.

What would happen if the USA - the major potential buyer - will quit the "game"? This scenario was actively discussed for several recent months. Let us analyse Table 2.

Table 2. Supply and demand for emission quotas at the global market without the USA

Countries	Expected emissions minus emission budgets*
EU	1 500
Japan	1 000
Other developed countries (Annex 2)	1 500
Russia	- 3 500**
Ukraine	-1 200
Eastern Europe	-400
Developing countries	-1000
Total	- 2 100

*Emission budgets are specified in Annex B to Kyoto Protocol. The column contains total differences for 5 years. Units of measure - tons of CO_2 equivalent.
** - means excess, + means shortage, i.e. countries with positive parameters in the second column belong to potential buyers, while countries with negative parameters belong to potential sellers.

It is clear that in conditions of oversupply, the price of emission quotas may easily drop to zero, or to be more precise - to trans-sectional costs.

Similarly, according to IPCC experts, the price will fall to zero unless some quantitative limitations for trading in emission quotas will be imposed.

It is clear, that Russia is not interested in the both of these options. What should Russia do?

1. To insist on preservation of key institutional arrangements of the Protocol, using the country's unique role for the Protocol's entry into force.
2. To "keep the door open" for the USA - the most important buyer for Russia (EU countries are more interested in buying Russian gas and electric power, rather than emission quotas, while Japan is more interested in promotion of its technologies and investments and it would prefer joint implementation and clean development mechanisms).

Prices at developing markets are defined by expectations. The statement of the President of the United States has clearly affected prices of forward and option transactions. If prior to COP-6 some sources suggested prices of $4 per 1 ton, now the price has fallen again. Preservation of key institutional arrangements of the Protocol and a possibility of its ratification by the USA would ensure some demand for Russian quotas in the future and result in growing prices for forward and option transactions.

2. Regional markets

Today, we can see only one example of such a market - the EU market. EU member-states had redistributed their emission budgets immediately after approval of Kyoto Protocol. Now they are preparing for initiation of trading in emission quotas. The market is regional, the range of its participants is limited to EU member-states and CEE accession countries. It is not clear, whether Russia or other countries outside the coalition will be able to propose their "commodity" at the market.

3. National markets

Denmark was the first country to establish a market of emissions quotas (though limited, - editors comment). Notwithstanding its zealous commitment to tax regulation, Denmark has made the right decision. UK is in process of serious preparations for introduction of emission quotas. Other countries are also discussing similar options. So far it is unclear, how national markets would interact with regional markets and the global one. Theoretically, it would be fairly logical to suggest comparatively swift integration of national markets of EU member-countries and the EU regional market.

4. Corporate markets.

BP market belongs to the most well known ones - the market was established by the corporation several years ago, in close co-operation with our organisation. British Petroleum made commitments to reduce its CO_2 emissions. According to J. Morford - the vice-president of the corporation - establishment of the Partnership will facilitate mutually beneficial co-operation of largest transnational corporations for mitigation of adverse impacts of global climate change.

In October 2000, several large corporations and the "Nature Protection" NGO (Environmental Defence, - editors comment) joined their efforts for prevention of global climate change. Oil and gas companies British Petroleum and Shell International, chemical corporation DuPont, power generation companies Sancor Energy and Ontario Power Generation, Canadian aluminium producer Alcan, French aluminium producer Peshini and "Nature Protection" declared establishment of the Partnership for co-operation in the climate sphere.

The Partnership is focused on co-operation of businesses and environmental organisations for prevention of climate change, limitation and reduction of GHG emissions with application of market mechanisms and experience exchange. The corporations committed to provide reporting on limitation and reduction of GHG emissions, to use innovative technologies and exchange experience and technologies in their co-operation within the framework of the Partnership.

In 1990, overall annual GHG emissions of the Partnership participants reached 360 million tons of CO_2. These emissions are almost equal to overall GHG emissions of France and are slightly lower than emissions of Canada and Italy.

Within the framework of the Partnership every corporation has set its own GHG reduction or limitation targets. For example, British Petroleum committed to reach 10 per cent reduction of GHG emissions comparatively to the baseline level (BP emission level of 1990), while DuPont committed to reach 60% emission reduction. Overall, if the corporations of the Partnership will fulfil their commitments, they will be able to reduce GHG emissions by at least 80 million tons of CO_2 equivalent by 2010. It is worth to note that never before any association of industrial corporations and environmental organisations has ever made such a large-scale attempts to reduce emissions of pollutants of global significance.

The Partnership corporations will use trading in emission quotas as their main mechanism to meet their targets. Use of the mechanism will allow the corporations to reduce GHG emissions without endangering their production operations and dividends of their shareholders.

As we can see, the above corporations assess the climate change problem seriously and are convinced that sooner of later emissions of greenhouse gases will be inevitably regulated and limited. Therefore, if sooner or later emission quotas will become a limited resource as well as other production inputs, a company will have to pay for the resource one way or another. If a company manages to reduce its consumption of the resource, its operational costs become lower and its competitiveness improves.

The share of Russian JS Co. "United Energy System of Russia" (RAO UES) in gross Russian national emissions of CO_2 reaches 30%. That is comparable to the emissions of Canada. This is the largest consolidated commercial portfolio of GHG emissions in Russia (and in the World). If companies were allowed, as countries, to be "direct" Parties of the Convention and Kyoto Protocol, United Power Systems of Russia would be ranked between France and UK with respect to GHG emissions.

In 10 years, facilities of RAO UES had managed to reduce their CO_2 emissions from 700 million tons in base year (1990) to 480 million tons in 2000. About 20% of the reduction is associated with measures for energy conservation and purposeful reduction of GHG emissions.

According to preliminary expert assessments, in the first budget period (from 2008 to 2012), the Holding would accumulate at least 400 million tons of CO_2 equivalent of emission reductions.

Besides that, implementation of a portfolio of investment projects for reduction of CO_2 emissions (if granted status of joint implementation projects), would allow to generate additional emissions reduction of 300 million tons of CO_2 equivalent.

Annex 1. Minimal elements of an international market for trading in GHG emission quotas and the key issues to be negotiated

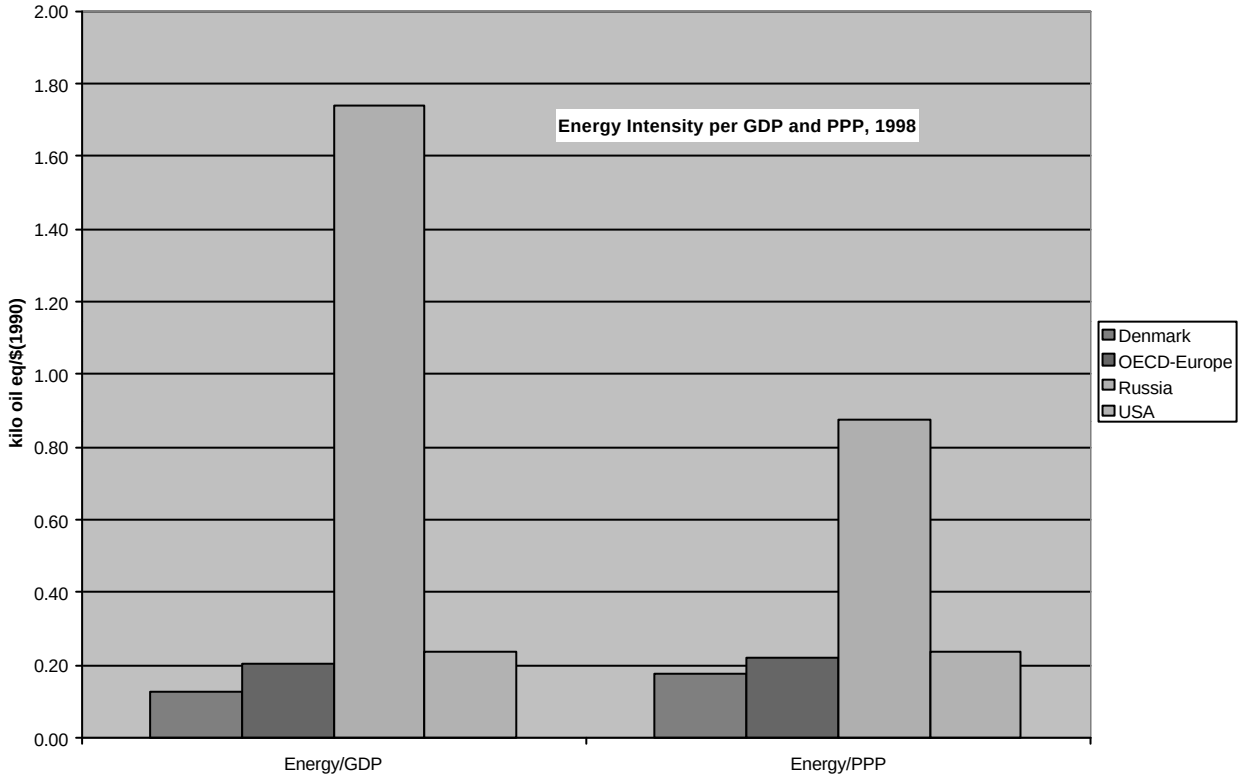
Minimal elements of an international market for trading in GHG emission quotas incorporate:

- Legally binding commitments to reduce overall emissions of a given substance (so called "bubble"). In this particular case, the limitations are set as national commitments of the Parties for 2008 - 2012.
- Measurement of emissions, registration and verification of declared emissions and transactions. The Protocol already requires emissions' measurement.
- Compatibility: definition of the object of trade, ensuring compatible units of measure for "commodity" to be sold under different flexibility mechanisms.
- Reporting: a system of legal responsibility of emission sources for fulfilment of their commitments. Provisions for enforcement in the case of failure to meet national commitments.
- Compliance with international legal standards. Participating countries and the Conference of the Parties should avoid making radical and unforeseeable decisions on rules of trading in GHG emissions, because market uncertainties hinder investments into long-term projects for emission reduction.
- Transparent processes of registration of transactions and transparent actions of all institutions, involved into trading in emission quotas. In order to ensure smooth operations of emission market, it will be necessary to build relations of trust with investors and the general public.

ENERGY EFFICIENCY AND ECONOMY, COMPARING RUSSIA WITH SOME OTHER INDUSTRIALISED COUNTRIES

By Gunnar Boye Olesen, Forum for Energy Development/ OVE-Europe,
The Danish Organisation for Renewable Energy

Energy efficiency is vital for a healthy development of the economy in all countries. In Russia, this is a more important reason to increase energy efficiency than the income from flexible mechanisms of the Kyoto Protocol. Today Russia has one of the world's highest energy intensities in its economy: primary energy consumption per GDP (gross domestic product) is more than 5 times as high as in the USA and over tenfold higher than in the country of Denmark, see graph below to the left.

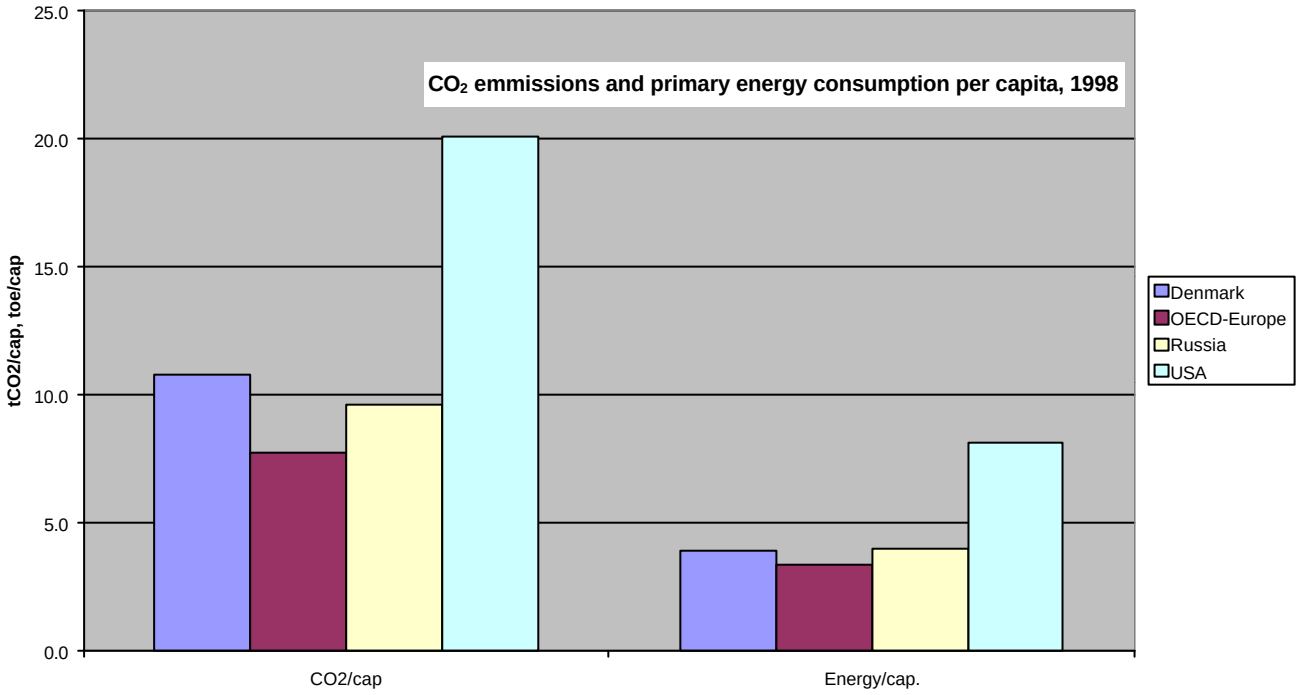


Graph: energy intensity of Denmark, OECD-countries in Europe, Russia, and USA

Of course it has to be mentioned that part of this difference comes from an under-evaluation of the Russian currency, but even when this is taken into account the Russian economy is inefficient regarding energy use, compared with Western Europe or USA. The graph above to the right shows primary energy consumption relative to the purchasing power parity (PPP). With the concept of PPP, prices are compared according to how much you can buy in each country, instead of using the exchange rate. Because the costs are highest in Western Europe and lowest in Russia, the difference in efficiency is less, if PPP is used to compare instead of GDP. With the comparison based on PPP, Russia is roughly 4 times less energy efficient than the other industrialised countries.

For the expected large growth of the Russian economy, improved energy efficiency will make such a growth much easier. Examples from Western Europe shows that this it is possible to increase energy efficiency, but a strong increase requires a consistent policy for energy efficiency, on federal level as well as on regional level.
The benefits from improving energy efficiency is already well understood by many actors in Russia, including the Russian JS Co. RAO UES.

Energy use equals Western Europe
The difference in energy consumption and CO_2 emissions between Russia and Western Europe is quite small, indicating that the Russian economy maybe could grow to the level of Western Europe's without increase in energy consumption. In this comparison it is the USA that has unusual high energy consumption per capita and CO_2 emissions. See graphs below.



Other reasons to work for energy efficiency
There are several reasons to work for a more efficient economy of Russia. In addition to above mentioned questions of the Kyoto Protocol and the efficiency as basis for economic growth, it should be mentioned that:

- Economic development requires a clean environment, not only globally, but certainly also locally. If environmental degradation is not addressed properly, it will erode the benefits of economic development, there will be no benefits of the economic growth for the population, no general improvement of living conditions. Energy efficiency will reduce energy demand, consequently reducing pollution
- In a more energy- and resource efficient economy, it will be easier to realise economic growth
- The price of natural gas is likely to increase in the future because the Russian domestic gas price is well below world market levels. Energy efficiency and renewable energy will not be more expensive in the future, they will rather become cheaper as the technological development will drive down their costs.

DANISH INITIATIVES AND PLANS IN THE FIELD OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

Gunnar Boye Olesen,
Forum for Energy Developnent/ OVE-Europe,
The Danish Organisation for Renewable Energy
INFORSE-Europe

SUMMARY
Initiatives for energy efficiency and renewable energy have had priority in Denmark for over 25 years. The Danish plans and initiatives have resulted in development of new technologies and of successful use of energy efficiency and renewable energy. This presentation will give an overview of the development, highlights of development of different energy efficiency and renewable energy technologies, the roles of NGOs, and future plans/visions.

Following the oil-crisis in 1973, a large number of initiatives were started to conserve heat. Initially the initiatives included:

- public information,
- strengthening of building codes (new buildings' annual space-heat consumption should be below 90 kWh/m2, later reduced further),
- energy audits with state subsidies to produce standardised reports of possible measures to reduce heat consumption.
- subsidies for weatherisation of houses, thermal insulation and regulation of heating

After 10 years the subsidies were ended. Currently the measures include:

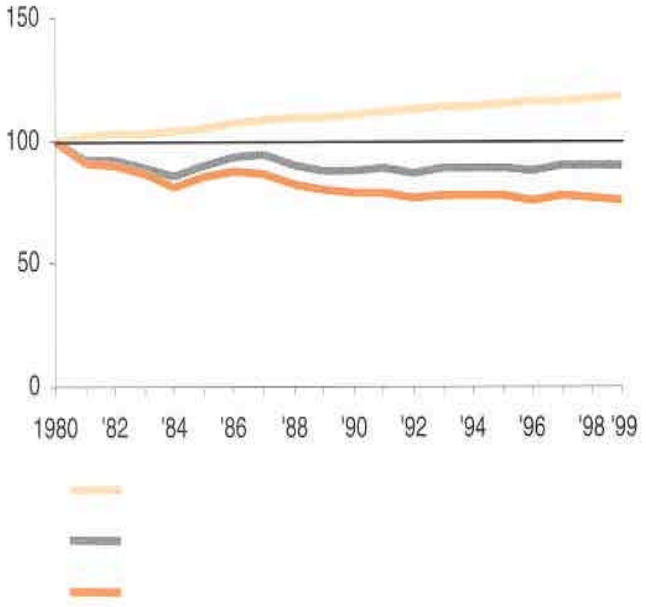
- public information, e.g. in 2001 was made a new campaign for use of low-energy windows with special coating
- building code, new houses consume less than 70 kWh/m^2 per year for heating
- audits and labelling of houses when they are sold, all houses must have an energy label when sold. To the label is a report about possible cost-effective measures to save heat in the house.
- special subsidies for energy efficiency in commercial buildings

Heat Conservation

The results have been a gradual decrease of heat consumption in Denmark, in spite of economic growth and an increasing area of heated floorspace. The final heat consumption in households was reduced 10% in the period 1980-99 while heated floorspace increased 19%, thus the specific consumption reduced 25%. In service sectors final space heat consumption was reduced 20% in the same period.

Development of household heat consumption in Denmark,

Index 1980 = 100.,
Temp. corrected figures.



More and Cleaner Biomass

The oil crisis increased dramatically the interest to heat the houses with wood-fired stoves and boilers; later also with straw-fired boilers. In the early 80'ies many households and farms could get subsidises to install boilers for central heating systems fuelled with wood or straw. Also some district heating systems could get subsidies if they changed from oil to wood or straw as fuel. In the 90'ies new activities were introduced. The new activities had an additional aim of introducing equipment for cleaner and more efficient use of biomass. Some of the older biomass boilers were not always efficient or clean enough in the combustion to meet modern demands. A special focus was given to change electric heating to biomass-based heating.

NGOs have been active in many of the activities. Before the national programmes were started, OVE and other NGOs were active in dissemination of information about biomass use, organising visits to people that already were using biomass for heating etc. NGOs were also pushing for the formation of local energy information offices, where people can get free, unbiased information about renewable energy that they can use themselves. Further, the NGOs pushed for start of the national activities to support local use of biomass.

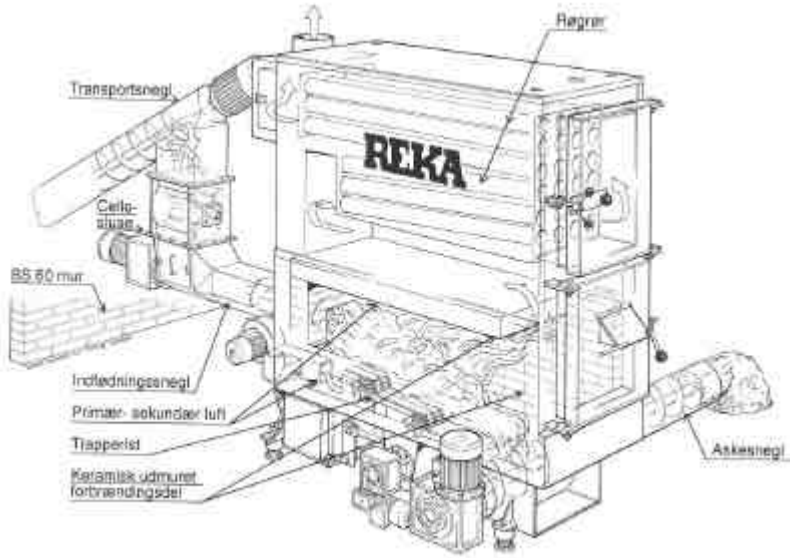
The results of the activities have been:

- gradual increase of biomass use, a doubling in the period 1980-99 to reach 35 PJ/year
- development and introduction of more efficient wood and straw boilers
- introduction of more automatic equipment that does not need the user to attend the boiler more than 1-2 times/week. Many of the new, small systems use wood-pellets made from saw-dust. This development was a response to consumer demand for less time-consuming heating systems, and it guarantees future use, as there is little risk that the users will get tired of biomass use (several users have got tired of the older more manual systems)

The biomass is increasingly used in ovens and boilers in individual houses; in small district heating systems fuelled with wood and straw; as well as in larger biomass-fired cogeneration stations for heat and electricity. For ten years a state subsidy for biomass boilers has been graduated after efficiency, giving the largest subsidies to the most efficient boilers, a measure that has increased considerably the efficiency of the boilers on the Danish market. Biomass use has

developed from 15 PJ in 1980 to more than 35 PJ in 2000, now covering 15% of the Danish heat demand.

An example of an automatic boiler for wood chips, capacity 100 – 1000 kW



Explanation: Woodchips are fed with a screw-transporter from a magazine behind the wall to the left, fall down through a fire stop to a new screw that feeds the wood-chips into the boiler. The combustion chamber is a the bottom and with ceramic sides and a screw to more the ash. Above the combustion is a flue gas chamber and at the top two sets of flue-gas tubes surrounded by the water that is heated in the boiler.

Cogeneration of Heat and Electricity

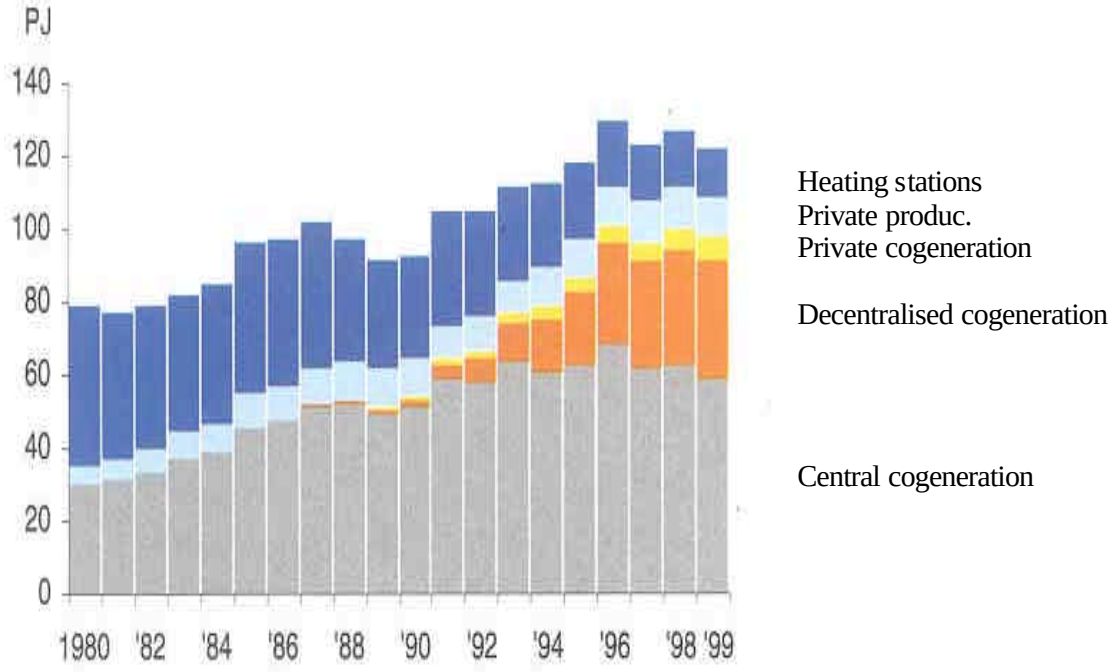
The development of cogeneration has been a cornerstone in the Danish energy strategy since 1975. Initially the development focussed on large-scale cogeneration for large district heating systems that supply heat to all larger towns, based on coal-fired cogeneration stations. OVE, other NGOs, and independent specialists recommended a focus on smaller cogeneration systems, fuelled with natural gas and renewable energy. These local solutions were the focus of the cogeneration development in the '90'ies.

The measures used were:

- Heat planning: all denser parts of towns are either heated with district heating or with gas
- Energy tax refund: natural gas fired cogeneration got a payment 0.10 DKK/kWh (1.2 UScent/kWh) from the revenue of the Danish energy tax.
- Loan guarantees: municipalities gives guarantees for investments, resulting in low interest rates
- involvement of existing district heating companies (owned by consumer co-operatives and by municipalities), and of newly formed consumer co-operatives that established new, small district heating systems in smaller towns and villages.
- Involvement of industry that has established industrial cogeneration

The result is that more than 50% of the Danish electricity production and more than 40% of space heating is made as cogeneration (80 % of district heating is from cogeneration, district heating supplies over 50% of the space heating). The use of cogeneration has almost tripled since 1980.

Development of Danish district Heating 1980-99



Windpower

While Denmark have had long tradition for windpower in the past and 30,000 windturbines were in operation in 1930, no electricity producing windturbines were working at the time of the oil crisis in 1973. Soon after the first modern windturbines appeared, produced by blacksmith with help of many technically talented persons including professional engineers, and based of principles of earlier windturbines. In 1975 several windturbine companies were active. In 1976 an organisation of windturbine owners was formed (Danish Windturbine Association) to protect the rights of windturbine users. The parallel development of manufacturers and user-groups raised the quality and increased the production volume of the emerging windturbine sector. OVE played a crucial role in this process by organising open meetings for people involved in windturbine development. At these meetings, ideas were discussed in open dialogues, also about technical details and without much secrecy. Together the involved companies and inventors developed the technology faster and better than they could have done individually.

In parallel to the development in the windturbine companies, groups close to OVE developed freely available standard designs of windturbines that individual blacksmith and metal manufacturers could use to produce their own windturbines. One of these groups developed into the Danish Folkecenter for Renewable Energy, now an independent center for development of renewable energy.

While the state established a good test station for windturbines, most state support in the first years went to a utility-lead initiative to develop large windturbines, an initiative that gave some interesting scientific results, but did not manage to develop competitive and reliable windturbines.

An important state-supported project was development of a wind atlas that made it easy to forecast performance of windturbines at sites all over Denmark. From 1980-89, state support was also used to subsidise investments in private windturbines.

In 1980 several companies had serial production of windturbines of the 55 kW class, that were more cost-effective than the cheaper, smaller turbines. These turbines were too large for most consumers, and in response to that OVE and local groups developed the concept of windturbine cooperatives, where several consumers invest in a windturbine together, place it at a good location and feed all the power from it into the grid. In this way it is possible to share a windturbine without making direct electric lines from the windturbine to each owner. Gradually rules were introduced, so that each member of the cooperative could only own shares in proportion to his/her electricity consumption and that the price received for the electricity from the windturbine equalled 85% of the consumer price of electricity. Today most Danish windturbines are owned by these consumer co-operatives.

While Denmark had had a remarkable windpower development in the 80's, the development in the 90's was tenfold stronger. In 2000 windpower's share of the Danish electricity production was 13%.

The reason for the strong development was a combination of:

- Fixed price for electricity from windpower
- National planning for windturbines, where each municipality had to allocate sites for windturbines.
- Regulation of connection fees for grid-connection of windturbines: the power companies are obliged to charge a cost-price for the connection to the nearest grid-point, and to pay eventual grid- reinforcement costs for connection of windturbines
- The decreasing price of windturbines, caused by the technical development and the increasing market.

Middelgrunden:
The latest and the largest windpower co-operative in Denmark where more than 7000 members own half of this 40 MW off-shore windpark outside the Copenhagen harbour. The other half is owned by the utilities. It was inaugurated in May 2001.

25 YEARS DEVELOPMENT IN DENMARK, - THE BACKGROUND FOR DANISH SUSTAINABLE ENERGY ACHIEVEMENTS

At the economic boom in the 60'ies the energy efficiency of the Danish society was quite low. The economic growth of that decade lead to a large growth in the energy consumption, and increasing reliance on imported oil. This dependence was felt hard during the oil crisis in 1973, when oil-prices shut up and the supply was limited. This crisis raised the Danish awareness of the need to save energy and to find alternative energy resources.

One of the first responses to this energy crises was large heat saving programs, in particular in the period 1974-84, but with some activities still continuing.

Soon followed a more comprehensive energy plan, combining energy conservation with change from oil to coal, large-scale cogeneration and nuclear power. This national plan almost excluded renewable energy and local solutions such as local cogeneration of heat and electricity. The response from many concerned citizens and some scientists was to question the nuclear power plans. In 1974 was formed a national NGO against nuclear power (OOA) and in 1975 was formed the Danish Organisation for Renewable Energy (OVE). There was a strong public debate concerning nuclear power and other energy questions. The debate lead to a gradual change in public opinion to be more critical towards nuclear power. In parallel to this, pressure from OVE as well as recommendations from independent scientists lead to state support for development of renewable energy.

In 1981, a new national energy plan was adopted, this time with focus on introduction of natural gas in Denmark and with more scenarios respectively with and without nuclear power. The nuclear power proposals in the plan from 1975 was still under discussion and it was foreseen that there would be a national referendum about the issue before any construction of nuclear power in Denmark could begin. In an alternative energy plan from 1983, made by independent researchers from Danish universities, detailed analysis showed that energy efficiency, renewable energy and local cogeneration could give a cost-effective energy system with minimal use of fossil fuel and no nuclear power.

In 1985 it was clear that neither the Parliament nor the majority of the public wanted nuclear power. As a consequence of this, the parliament decided to remove nuclear power from Danish energy planning without a referendum. This decision is still in force, and a recent poll (May 2001) shows that 86% of the Danish voters are now against nuclear power.

The next chapter in the Danish energy planning starts with the Brundtland report "Our common future" from 1988 and the following decision by the parliament to make sustainable energy plans for the most important sectors. The Danish sustainable energy plan "Energy 2000" was ready in 1990, proposing increased energy efficiency, local cogeneration and more renewable energy. The goal of 20% CO2 reduction by 2005 from 1988 and introduction of CO_2 taxes were parts of the new plan.

The "Energy2000" was followed by a new energy action plan, "Energy21", from 1996. It marked a continuation of the activities for a sustainable energy system and set with new targets, including indicative targets of 50% CO_2 emission reduction 1990-2030 (weather adjusted figures) and of having 35% renewable energy in the Danish energy mix by 2030 (from 5% in 1990).

In the following is a number of successful examples of large-scale implementation of energy efficiency and renewable energy in various Danish sectors. Not all sectors shown such successes, e.g. in the transport sector sustainable energy plans have failed.

NGOs have been important to catalyse the development of sustainable energy in Denmark. They organise local users, inform about the possibilities, make campaigns, provide feedback to the state about problems in the development, etc.

Future Plans and Goals
The Danish plans are to continue development of renewable energy and energy efficiency to reduce CO2 emmissions without using nuclear power. Denmark has made a commitment to reduce CO2 emmissions 21% from 1990 to 2010, now a part of the EU burden sharing to reach the Kyoto goals. For the long-term, Denmark has set a target of 50% CO2 reduction 1990-2030. Increase in renewable energy to cover 35% of primary energy supply in 2030 will be an important part of this. From the Danish NGOs, the vision is to go beyond these official targets and cover 100% of Danish energy demand with renewable energy, within 30-50 years. Past development shows that a rapid transition is possible in energy demand and supply. Examples of this are introduction of heat conservation in the 70's and early 80's as well as installation of with windturbines and local cogeneration in the 90's. With milar rapid developments in the future, the NGO visions could become reality.

The heat conservation activities have involved almost all house-owners in Denmark. In this way it has been a large-scale public education endeavour, leading to activities of a large part of the population to improve their houses.

Sources:
Figures and graphs from Danish Energy Agency's Energy Statistics 1999, available from www.ens.dk in Danish and English.

BIOMASS AND WINDPOWER OPPORTUNITIES IN RUSSIA

G. Dmitriev, Vetr-Energo, Murmansk and Gunnar Boye Olesen, FED/OVE

Russia has some of the largest potentials of renewable energy in the world. If the world decides to choose a sustainable development path, Russia will be able to cover all its energy need from renewable energy, and might even be exporter of renewable energy to other European countries that are less gifted with these natural ressources. This paper gives a short overview of two of the renewable energy sources.

Biomass in Russia

Russia has large resources of biomass from forest and agriculture that can be used for energy purposes. The Swedish NUTEK evaluated the biomass resources in the European part of Russia alone to be over 400 Twh/year, consisting of:

- 265 TWh/year of unused wood that potentially could be taken from forests and used e.g. as woodchips for heating
- 109 TWh/year that is already used as firewood
- 58 TWh/year of agricultural residues, including unused straw and residues already used for energy purposes today
- 37 TWh/year of surplus wood residues from wood industries

In a later evaluation of the potential in North West Russia is estimated that residues from sawmills and pulp and paper industry are as much as 45-50 TWh/y in the oblasts of Murmansk, Arkhangelsk, Kerelia, Vologda, Komi, Pskov, Novgorod, Leningrad). These residues could fuel 13,000 MW of heating stations.

Biomass can be used for heating in small and large applications for households and industry. It can also be used for power production and for cogeneration of heat and electricity. One of the most viable applications is to replace gas, oil and coal in district heating stations. In many places biomass can replace fossil fuel with the necessary investments paid back in 2-5 years (simple pay-back period)

In addition to increased use of biomass, it is also important that existing biomas users have clean and efficient technology. This will maximise the biomass potential and will ensure that biomass is a clean technology, also regarding local pollution.

Several projects are under development to increase the use of biomass in Russia. One of them is the proposed Russian-Nordic programme for fuel switch to biomass in North-West Russia. It aims at a development of a Russian biomass boiler industry and a switch to biomass in 100-200 heating stations, replacing 2.5 - 5 Twh/year of fossil fuel. Investments to realise this has been estimated to 100 - 200 mill. EUR, part of which is expected to come from international financing.

Windpower in Russia

Russian windturbine history

Windturbines has a long history all over the world. In the territory of modern Southeastern Russia windmills have been constructed in III-IV centuries AD and in 1913 in Russia there were more then 1 million. windmills.

Systematic research into modern windturbines began in 1920 in the environs of Moscow – Kuchino town. The Central Aero-hydrodynamics Institute (TsAGI) during 1931-1941 near Balaklava settlement (Crimea) has been projected and built the first pilot wind power station (WES) D-30 with the capacity 100 kW. The diameter of the windmill rotor was 30 meters. By that time the wind power station was the most powerful in the world.

In 1935 has been published the first “Atlas of wind energy resources” .

After the World War II the wind energy development drastically changed. Cheap fuel and tendency to increase the generating unit capacity in order to improve their efficiency practically pushed out wind power in the field of small and isolated consumers. But then in agriculture the old mechanical windmills began to be changed by windmills, equipped with electrical generators (WECs).

In 1947 in the USSR has been manufactured the first batch of fast speed three-blade stabilized wind engines D-18 with horizontal rotation axe and with units capacity 25 kW. This windmill and its modifications D-12 and 1D-18 during several years were the main which been used for wind energy implementation into industry and agriculture. In following years, straight till the world oil crises arising in the middle of 70th the practical activity and development in wind energy, same as in small hydro power, been decreased.

Present Status

Wind energy continue to be developed in general in agriculture and for small, local, out of grid consumers. There have been produced windmills of small capacity for operating mainly as sources of energy for isolated consumers or in hybrid systems – windmill-diesel generator. In the field of large-scale wind energy have been working out projects of 100 and 250 kW machines. During the last twenty years in Russia have been made a large quantity of regional research works on assessment of wind regime and wind energy resources. At present in Russia research workers of Danish-Russian Institute of Energy Efficiency prepared "Russian Wind Atlas", made according to European methodology, also used for the EU countries.

Regarding large windpower, 7 turbines are now in operation at the Zapoliarnaja wind power station in Komi republic, near Vorkuta city . The largest Russian made windturbine with capacity 1MW is installed in Kalmykia Republic, but to reach the planned installed capacity of wind power station could takes a long time . Already manufactured for Kalmykia Republic are four more new 1 MW aggregates, but they are laying in plants storehouse because customers haven't money to pay.
In Kaliningrad region has been put into operation first large WEC with capacity 600 kW made in Denmark, produced by "Wind World A/S" and entirely financed by Danish Government. Two 250 kW NEG Micon wind turbine are installed in Komandorskiye islands with the technical and financial help of Denmark.
In Bashkiria Republic is planned to install four ET-550/41 wind machines 500 kW of installed capacity each and if its operation will be successful they plan to install more in nearest future. The installations are already delivered to the site and are stored there.
During last two years in Murmansk and Arkhangelsk regions have been installed 11 small wind turbines (10 kW each, Bergey type), delivered here from USA according with the program Chernomyrdin-Gore. Several dozens small WECs are working in Russia for isolated consumers in other parts of the territory. Taking this into account a general figure of WECs total installed capacity in Russia could be around 5 MW (end of 2000).

Huge Wind Energy Potential

Russia is one of the largest countries in the world and it is situated in different climatic zones, which cause high wind energy potential. Highest wind energy potential is along Russia Federation seacoasts, in the vast territories of steppes and in mountains (wind map available). Estimation of wind energy potential of Russia has been done several times. The latest estimations, mentioned in are shown in the tables below.

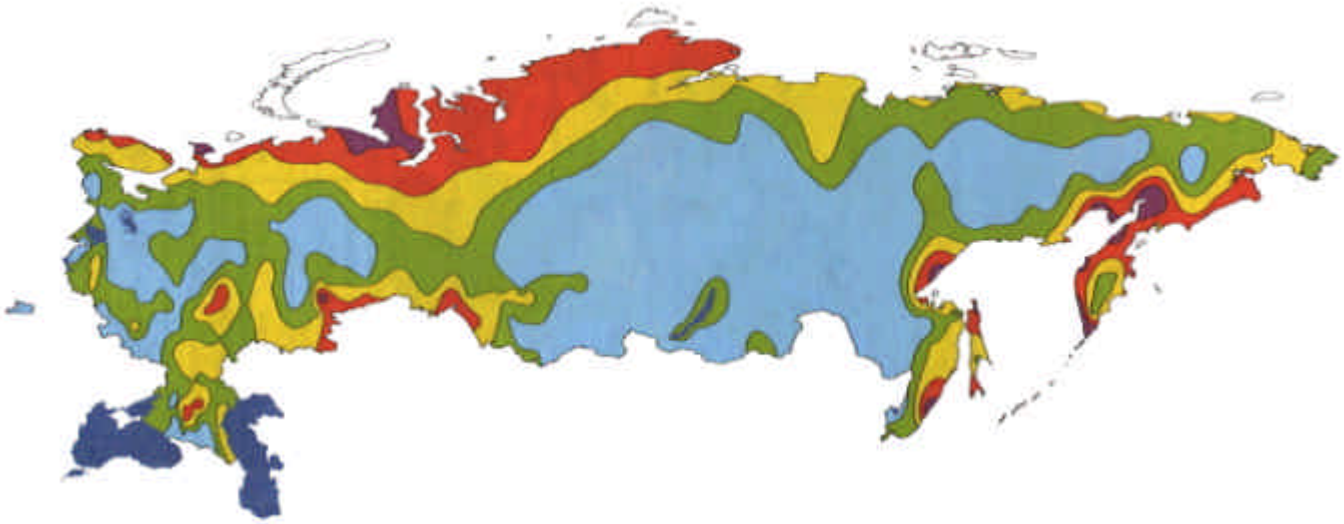


Fig. Wind resources at hight 50 m. above ground level for five different topographic conditions.

	Sheltered terrain		Open terrain		Sea coast		Open sea		Hills and ridges	
	m/s	W/m²	m/s	W/m²	m/s	W/m²	m/s	W/m²	m/s	W/m²
	>6,0	>250	>7,5	>500	>8,5	>700	>9,0	>800	>11,5	>1800
	5,0 – 6,0	150 - 250	6,5 – 7,5	300 - 500	7,0 – 8,5	400 - 700	8,0 – 9,0	600 - 800	10 – 11,5	1200 - 1800
	4,5 – 5,0	100 - 150	5,5 – 6,5	200 - 300	6,0 – 7,0	250 - 400	7,0 – 8,0	400 – 600	8,5 – 10,0	700 – 1200
	3,5 – 4,5	50 - 100	4,5 – 5,5	100 - 200	5,0 – 6,0	150 - 250	5,5 – 7,0	200 - 400	7,0 – 8,5	400 – 700
	<3,5	<50	<4,5	<100	<5,0	<150	<5,5	<200	<7,0	<400

Wind energy resources in Russia, overview:

Part of Russia	Gross wind energy resources, TWh/year	Technical resources, TWh/year
European part of Russia	29600	2308
Siberia and Far East	50400	3910
Total	**80000**	**6218**

Unfortunately the majority of wind potential is located in sparsely inhabitant territories, where the population density is less then 1 person on square km. In many of the most windy places, wind energy can be used only as energy source for small isolated consumers. Utilisation of wind energy at these places could save a lot of fuel, expenses for its transportation and improve the conditions of living for local communities. However, those sites aren't the sites, which could make it possible to cover maybe 10% of country's demand in electricity up to 2020 (a worldwide goal proposed by some NGOs).
Large-scale system application of wind energy is possible: in the Eastern seashore of Sakhalin island, in the extreme south of Kamchatka, near settlements Pevek and Bilibino in Chukotka peninsula, on the seashore of

Magadan region, inside the zone of high-voltage network of "Magadanenergo" access, Southern seashore of Russian Far East in the zone of Vladivostok - Nickolaevsk-na-Amure – Komsomolsk-na-Amure high-voltage network service, steppes along Volga river in neighbourhood of Volga hydropower stations chain high-voltage lines, Northern Caucasus steppes and mountains, at last, but not least, in Kola Peninsula, where wind conditions are extremely favourable, where exists power engineering infrastructure in the form of conventional electrical power stations and large scale industrial consumers.
Besides that in these territories there are vast almost uninhabited lands which could be used for wind park creation, without expensive off-shore developments as it is planned in many of the West European countries. Moreover in Magadan region and especially in Kola Peninsulas there are significant compensation facilities in the form of existing hydropower stations for decreasing or complete smooth over the unstable wind regime.

The European part of Russia is the most highly developed territory with high population density. More, then 65% of electricity or about 700 TWh a year is consumed in European part.
The share of hydropower electricity production in European parts energy balance is about 8,5%, the share of nuclear power is about 13%. The rest of income part of balance is the production of traditional thermal power stations. The stations which are using gas as a fuel makes up 71%, and the rest 29% are the coal-firing power stations.
In the following table is shown the distribution of gross and technical potential according to economical regions of European Russia. In Northern economical region are included, according official administration division Murmansk, Arkhangelsk and Vologda oblasts and Komi and Karelija Republics. Comparison of the data from the table and technical hydropower resources confirm the possible great future of wind energy.

Distribution of wind energy resources on economic regions of European part of Russia

Economical region	Gross wind energy resources, TWh/year	Technical resources, TWh/year
Northern	11040	860
North-West	1280	100
Central	2560	200
Volgo-Viatskij	2080	160
Central-Chernozem	1040	80
Volga	4160	325
North Caucasus	2560	200
Ural	4880	383
Total	**29600**	**2308**

Compared with the electricity demand of European part of Russia, about 700 TWh , it is not the potential, which will limit wind power development.

Economy

The economy of windturbines are crucial for the development. In Denmark, new windturbine projects cost about 900 EUR/kWh, including foundation and grid-connection. With this investment cost and 10 % discount rate, indicative costs of windpower can be found in the table below for different average wind speeds:

Wind speed at rotor height (e.g 50 m)	Energy yield, kWh/m2	costs (US c/kWh)
6	691	6,7
7	1098	4,6
8	1638	3,4
9	(2333)	(2,7)
10	(3200)	(2,2)

Figures in brackets are above standard conditions for windturbines and reinforcement of structures might have to be made.
Assumptions: Lifetime 20 years, operating and maintenance 0.01 EUR/kWh, exchange rate 0.86 EUR/US$, rotor area 2,3 m^2/kW installed.

Figures are indicative only, and for the first projects higher costs are usual due to introduction of new technology. On the other hand, it is possible that windturbines can be produced cheaper in Russia in the future. Also projects with used windturbines can be made with lower investments.

Sources:

Trade in biofuel, NUTEK, Stockholm 1993 (ISSN 1102-2566)

Guideline for Estimation of Renewable Energy Potentials, Barriers and Effects. INFORSE-Europe, 1997 (available at www.orgve.dk/inforse-europe)

Personnal information from Dag Hoeystad, Norwegian Nature Protection Association.

Wind energy possibilities for Russia. Report of Grigori Dmitriev to INFORSE-Europe wind campaign, 2001.

BROADENING OPPORTUNITIES FOR USE OF RENEWABLE ENERGY SOURCES IN THE SOUTHERN REGION OF THE RUSSIAN FEDERATION

M. Saparov, the Centre for Development and Implementation of Technical Assistance Projects

South Russia has high potential of renewable energy sources, including geothermal, solar and wind power. However, notwithstanding some research and development capacity and available pilot studies in almost all spheres of renewable energy, actual use of renewable energy does not meet regional power demand. The main obstacles for implementation of renewable energy sources include the following ones:

- serious economic problems, resulting in short supply of investments (both foreign and internal ones);
- distorted prices of fossil fuel;
- comparatively high prices of specialised equipment, necessary for use of renewable energy (the equipment is produced in pilot batches only).

The Centre for Development and Implementation of International Technical Assistance Projects, jointly with experts of the World Bank, the Energy Institute and other specialists, have developed a feasibility study for broadening of opportunities for use of renewable energy sources in Southern Russia. The study materials were used for development of the specialised section of Federal Focused Program "The South of Russia".

The Program stipulates development and implementation of a comprehensive set of measures to facilitate application of geothermal, solar and wind power. Besides allocation of finance resources from the state budget, the Program stipulates also mobilisation of investments from extrabudgetary sources, including international organisations, e.g. the Global Environmental Facility (GEF).

Specific activities for broadening of application of renewable energy in the region incorporate the following ones:

- analysis of the resource base of the region and identification of the most efficient sites for deployment of geothermal wells, wind turbines and solar installations;
- development of feasibility studies for investment projects, associated with use of renewable energy;
- development of a regional training and information renewable energy centre;
- development of a concept for establishment of an institutional and financing mechanism for implementation of renewable energy projects;
- conducting of an international seminar, dedicated to broadening of opportunities for application of renewable energy in the Southern Russia.

Implementation of the above works would provide additional benefits and incentives for more efficient use of renewable energy sources in the region and mobilisation of investments.

The project incorporates four major components. Three components are associated with broadening of application of geothermal power, solar power and wind power, respectively. The fourth component is associated with institutional support, capacity building and development of necessary preconditions for more efficient use of renewable energy in the Southern Russia.

The range of anticipated results of the project incorporates:

1. Analysis of geothermal resources of the region and potential capacity of wind power and solar power in the Southern part of European Russia.
2. A set of documents on technical and environmental assessment of geothermal wells and potential sites for deployment of wind turbines and solar installations in the region.

3. Feasibility study for construction of demonstration binary cycle geothermal power plant with 3MW electric generation capacity.
4. Feasibility study for use of geothermal water in Dagestan (based on application of double-pressure heating systems and binary geothermal heat and electricity generators).
5. Feasibility study for construction of demonstration solar power plant with 1MW generation capacity.
6. Feasibility study for use of solar power in urban heating systems of Rostov-on-Don.
7. Investment proposals for construction of wind turbines in the region.
8. Materials of the international seminar on use of renewable energy in the Southern Russia.
9. Proposals on establishment of a regional renewable energy training and information centre and training/production facilities, dealing with geothermal, solar and wind power in the Southern Russia.
10. The concept for establishment of an institutional and financing mechanism for implementation of renewable energy projects in the Southern Russia.
11. A regional program for use of renewable energy, including a sub-program for use of renewable energy sources for independent power supply of protected territories and national parks.
12. Strategic environmental impact assessment of the Program, including public consultations

DEVELOPMENT OF THE NEW CONCEPT OF REGIONAL POWER SUPPLY AS A FACTOR OF ENERGY SECURITY.

A. Shalinsky, Volzhksy State University

Any regional energy policy should be focused on ensuring socio-economic development of a region, based on efficient, reliable and safe power supply, guaranteeing minimal costs of production, conversions, transportation and consumption of fuel and electric power and tolerable environmental impacts of industrial factors.

Power supply problems of Volgograd Oblast are associated with lack of efficient local power supply facilities. Available local power plants (i.e. Volgograd thermoelectric plant and Volgograd heat-and-power plant No. 2 (HPP-2), as well as Kamyshin HPP, Mikhailovsk HPP, Volzhsk HPP-1 and HPP-2) generate comparatively expensive electricity, because HPP of Volgiograd Oblast were designed mainly for heating purposes, and produce electricity as a by-product.

In Soviet time, HPPs were constructed to meet requirements of local industrial facilities and utilities and nobody was interested in their finance viability. According to initial technologic specifications, HPPs of Volgograd Oblast have much higher fuel consumption per unit of electric power than large power plants (facilities of the Wholesale Federal Electricity Market). Industrial development and socio-economic development of the Oblast are hindered by lack of efficient local power supply sources, as a result, industrial facilities of the Oblast and local economy are heavily dependent on external political and economic factors and face permanent uncertainties, that cannot promote sustainable growth of socio-economic parameters. Enterprises cannot afford to pay high prices for electricity, generate profits and pay taxes to the budget simultaneously. Experts blame energy difficulties in the region as the main cause of steady decline of production output in the Oblast since 2000. Correspondingly, tax payments to the budget are also decreasing - having paid their electricity bills, enterprises simply do not have money to pay their taxes. The increase of electricity tariffs is a severe blow to agriculture facilities of the Oblast (according to the Governmental Decree, all energy payment benefits of agriculture facilities were withdrawn from 01.01.2001).

Under these conditions, facilities of Volgograd Oblast have several potential options to address their energy problems:

- switch to use of power supply services of facilities of the Wholesale Federal Electricity Market (the option has been selected by Volzhsky Pipe Plant and Volgograd Abrasive Plant). Similar options are being explored now by "Kaustik" and "Khimprom" facilities. In this case, the local administration loses all remaining opportunities to control power supply situation in the region, that also endangers regional energy security,
- establishment of fuel-and-energy and chemical-and-energy holdings (this option is being used now by HPP-2 and Volgograd Oil Refinery, HPP-3 è “Kaustik”, Volgograd thermoelectric plant and "Khimprom", HPP-1 (Volzhsky) and "Sibur-Volzhsky" Co.),
- implementation of alternative and energy efficient technologies. This option would require substantial inflow of finance resources into the Oblast.

  For example, in 5 recent years, municipal utilities have managed to achieve substantial reduction of fuel consumption due to introduction of energy efficient technologies and modern equipment (reduction by 16%, comparatively to 1997) with simultaneous increase of heat production (by 47%). These measures allowed also to reduce production costs of heat energy supply (in some cases - in 7 - 8 times).

- construction of facility level mini-HPPs (this option is preferred in other countries). Besides that, the option of construction of highly efficient facility-level power generators was discussed at the meeting of chiefs of local administrations and municipalities of Volgograd Oblast in February 2001.

In order to address power supply problems of the region, it is necessary to develop a radically new regional energy concept. The concept should provide more opportunities for local administrations to influence processes of power supply management of local utilities and production facilities, accounting for local conditions and needs (i.e. it is necessary to delegate authority for decision-making in management issues to the regional level).

"EcoInform" Kurgan district, environmental NGO

New construction principles are universal. Underdevelopment cannot be used as an excuse for a failure to engage in sustainable development actions, because underdevelopment is the most common cause of the most severe pollution impacts and the most inefficient use of natural resources. Development of underdeveloped regions by import of high-tech technologies, materials and equipment and export of raw materials results in inequality in distribution of wealth and decrease in wealth for the bulk of population. Moreover, it usually results in higher environmental contamination due to non-existent waste-management systems and higher incidence of industrial disasters. At the same time, sustainable development at local and regional levels may be achieved only by sufficiently diversified regional economies, providing necessary opportunities for materialisation of creative capacity of the majority of population. Otherwise, an underdeveloped region will inevitably encounter migration of economically active residents to more developed regions, accompanied by economic decline, reduction of living standards and environmental degradation.

Integration of sustainable construction and housing-management technologies and bio-intensive agriculture technologies for use at adjacent land areas provides an opportunity for establishment of local sustainability cells, guaranteeing modern amenities and healthy way of life. In practice, these sustainability cells are spreading rather slowly, mainly due to efforts of enthusiasts from developed countries. However, development of these sustainability cells does not need substantial investments and may be accomplished at almost any development level. Broad spread of sustainability cells would provide necessary preconditions for transition of sustainable development of the humankind as a whole.

Pursuing our goals of sustainable development and decent housing, we are returning to experience of ancient Roman settlements, that evolved in harmony with Nature and were based on free creativity of their residents (except for the slaves, -editors comment). We are stripping away the negative experience of the industrialised epoch, that produced cities, absolutely unsuitable for health of their residents and health of future generations. We are quitting the epoch when settlements were designed and constructed, based on plans, developed to satisfy narrow economic or production ambitions of a leader or two. We become increasingly aware, that cities and other human settlements should develop, based on creative capacity of their residents. Broader opportunities for materialisation of creative capacity of people in all spheres of life mean more sustainable development. This may be compared with natural biological diversity - in nature, sustainable development is impossible without maintenance of natural biodiversity. Sustainable development requires to reject prevalence of standard construction and pre-planned settlements. It is necessary to switch to a higher diversity of needs and individual preferences of their residents.

Housing designers also face a dilemma: either we should use durable construction materials and design long-lasting housing, or we should use cheap materials, allowing easy recycle and reuse and design housing for a short period of use. It is clear, that provided contemporary shortage of housing, the both approaches to housing design and construction will coexist for a long time. However, as the experience of several thousand years shows, in addressing strategic problems, a sustainable solution should be based on the famous Virtuvius' triad: durable, comfortable and beautiful. Naturally, several ages of history have introduced some corrections into these concepts. If earlier durability meant protection from external natural impacts and enemies' weapons, now durability is understood mainly as long useful life of housing. Besides that, we need to add a new condition, that was met in ancient times without efforts, but now it requires to be provided - i.e. the concept of minimum. Minimum means minimisation of use of natural resources and power and minimisation of adverse human impacts on the environment. Ideally, we should add also the creative principle of the future - i.e. improvement of the environment instead of destructive human impacts in the past.

Straw, grass, leaves, reed, cane - all these traditional construction materials are used as pure construction materials or as components of lime and clay mixtures. Adobe houses are widely used. In Kazakhstan, reed fibre blocks are used for construction purposes. Straw was commonly used as roof cover in Russian villages.

In early 19th century, straw-based construction was widely used in Nebraska (USA) after application of steam presses for straw. Standard bricks of pressed straw were proven to be a good construction material. Due to lack of alternatives in the area, straw bricks were broadly used in Nebraska. Practical experience shows, that if pressed straw blocks are protected from rain, they allow to construct durable and energy efficient houses and other constructions with excellent indoor climate and sufficiently safe. We may encounter straw houses without substantial damage after 100 years of use. In the 1930s, construction of straw housed was abandoned due to application of new technologies and changes in socio-economic conditions in the area.

In 1980s some American enthusiasts started to renew the traditional construction practice, that clearly meets many modern environmental and economic requirements. Excess straw in agriculture areas is often burned on-site - this is not a good option for use of the valuable natural resource. Now, there are non-governmental organisations, that disseminate experience of energy efficient construction and are ready to engage in exchanges in experts and experience in the sphere.

ALTERNATIVE ENERGY AT THE NORTH CAUCASUS - TODAY AND TOMORROW

I. Pertseva, non-governmental organisation "Don Community against Rostov NPP"

The North Caucasus is a developed region of Russia with high population density. As a result, issues of power industry, energy conservation and environment are among the highest priorities in the regional agenda.

The bulk of power generation capacity in the region belongs to traditional power plants, however, in recent years no new power-generating capacity came in operation, while old power plants badly need equipment replacement (installations of power plants of Rostov Oblast Generating Company have 49% deterioration rate, while in the case of Novocherkassk thermoelectric plant the figure reaches 69%), and prices of fossil fule continue to rise. All these factors make use of alternative power a significant option. Besides that, due to controversial issue of putting Rostov Nuclear Power Plant into operation in the near future (the majority of local residents are against this dangerous facility), experts and environmental community are increasingly often exploring the option of alternative energy.

Wind, solar radiation, sea waves and biomass belong to easily available sources of energy. Public relations experts of nuclear and fuel and electricity industries claim, that renewable energy sources and energy efficiency measures "do not pay" and cannot provide power supply for a modern industrialised economy. In Rostov Oblast, the share of alternative sources in the overall electricity generation is lower than 1% - Rostov Oblast Generating Company even does not mention these sources in its reporting.

But actually, in recent decades, renewable energy technologies demonstrated major achievements (many of them are absolutely unknown to politicians, the general public and even power industry experts). Now their productions costs reached levels that allows them to compete with fossil fuel and nuclear power. For example, since 1980, production costs of solar cells decreased more than by 90%, while production costs of wind turbines decreased by two thirds. Moreover, alternative energy sources benefit from introduction of stricter environmental requirements for power plants, that burn fossil fuel (these requirements result in higher electricity prices.)

SOLAR POWER.

Geographical location of the North Caucasus allows us to assess prospects of solar power in the region rather high. Experience of the European countries suggest possibilities of broad and efficient application of solar collectors and solar cells for independent power supply of installations with low energy consumption. Plane solar collectors are used for heating water to 60 -65^{o}C. These environment-friendly collectors have simple and reliable design and may be used to serve a diverse range of industrial, agricultural and municipal users (with payback time from 3 to 5 years). Now similar installations are used at the Black Sea coast, in Mahachkala, Nalchik, Rostov-on-Don, Azov and other cities of the region.

Pilot tests were carried out for application of solar collectors for preheating of water in district boiler. Their application allows to reduce consumption of fossil fuel by 25% and improve environmental performance of the heaters. These preheating schemes are operational in Shakhty, Morozovsk, Anapa, Krasnodar, Timashevsk and Ust-Labinsk.

It seems appropriate to explore opportunities for use of solar collectors in centralised systems of heating and water supply (for supply of hot water at summer).

There were rather promising works, associated with use of plastic solar collectors for agriculture installations. Low production costs provide competitive advantages comparatively to solar collectors made from brass or stainless steel. Plastic solar installations were tested in long-term operation in Rostov Oblast and Dagestan.

It is necessary to note that all facilities, that produce solar collectors, are located in the Middle Russia, while at the North Caucasus they are only assembled on-site - as a result, their costs increase by 20%. It would be appropriate to arrange production of the collectors in the region.

WIND POWER

Development of wind power applications in Russia substantially lags behind the international level, notwithstanding opportunities for practical use in many regions of the country. In the case of the North Caucasus, the most promising areas for application of wind turbines include the following ones:

- coastal water areas of the Azov Sea.
- piedmont areas of the North Caucasus, including coastal land areas of the Caspian Sea and interfluve zone between the Don and the Volga.
- a large part of Kalmykia.

In Rostov Oblast, average annual wind velocity is comparatively modest (4 - 5.8 m/s). However, even at these low wind velocities, estimated generation capacity of wind turbines in the Oblast is assessed as 15.7 thousand MW. Experts recommend to construct wind turbines in rural areas at the north of the Oblast.

In 1991, "KuibyshevHydroProekt" JS Co. had completed the feasibility study for construction of Dagestan Wind Power Station with generating capacity of 6 MW. In 1996, in Zimlyansk district, Markinsky Pilot Wind Power Station was constructed (jointly with German partners) with 300kW generating capacity, 1MW wind turbines are being installed in Kalmykia.

Construction of wind power stations is considered as a rather expensive venture, however, a more detailed examination of design documents allows to reveal that overall costs incorporate improvement of adjacent areas (as, for example, it was made for Markinsky Wind Power Station).

Now, purchase of a license for production of one or two modern wind turbines is considered as the shortest and the most appropriate option for production of wind turbines in the region.

The second option (if the new economic conditions will allow to implement it) is associated with development of an assembly line for foreign wind turbines in the region and local production of some blocks. Beside that, there are diverse business proposals of foreign companies, that propose to construct wind power stations at different commercial conditions (with generating capacity up to 20MW).

BIOMASS POWER

Biomass power options incorporate use of plant materials for production of liquid/solid fuel or generation of heat and electric power. Biomass fuel may include almost all biological materials - from timber and cuttings to straw, manure and household waste. Biomass fuel covers 38% of

primary power consumption in developing countries, where three fourths of the Earth pollution live.

Incineration of garbage and household waste was not broadly used due to low environmental performance of garbage incinerators, but there are several operational incineration plats in Moscow, Saint-Petersburg and Piatigorsk. Garbage incineration plant in Rostov-on-Don (now at the construction stage) will be used to power a small capacity gas-turbine power station.

It seems appropriate to construct anaerobic waste-treatment installations in all large cities of the region (similarly to foreign practices) to generate bio-gas.

Well-developed livestock economy in the region allows large-scale application of bio-gas installations. These installations provide the economy of scale - larger animal farms allow to reduce unit costs of the installations (payback time for bio-gas installations varies from 3 to 5 years).

It would be appropriate to use bio-gas installations at wastewater treatment facilities in Rostov-on-Don, Krasnodar, Mahachkala, etc. The bio-gas may by used in facility boilers for heating and hot water supply.

MINOR RIVERS

In 1940s - 1950s, numerous small and mini-hydropower stations were constructed at the North Caucasus, but after switching to centralised power supply, these stations were either decommissioned or dismantled.

In recent years, plans were developed for reconstruction of old and construction of 29 new small hydropower stations in Stavropol Krai, Kabardino-Balkaria, Karachaievo-Cherkessia and the North Osetia - Alania (with overall generating capacity of 214MW).

Numerous minor rivers of the region (especially in mountainous areas) and irrigation systems might allow to improve power supply of remote small power consumers of household and agriculture sectors, due to small hydropower stations. There are up to 13 thousand minor rivers in Krasnodar Krai (plus about 500 minor rivers in Rostov Oblast and 285 minor rivers in Dagestan).

Operations of mini-hydropower stations require regulated water reservoirs (associated with flooding and exclusion of land areas).

At the same time available designs of micro-hydropower stations (sleeve, string and pontoon stations) do not necessitate construction of dams or other engineering constructions and operate as environment-friendly installations.

Use of hydropower resources is complicated by substantial seasonal variations of river stream flows. In order to arrange large-scale use of micro-hydropower stations in the region, it would be appropriate to organise production of widely applicable and technically simple sleeve and pontoon hydropower stations with generating capacity from 0.3 to kW. Available production capacity of our industrial facilities allows to design and produce a technically/economically competitive mobile hydropower installation with unit generating capacity of 0.3 - 0.5kW.

GEOTHERMAL POWER

In the North Caucasus, substantial geothermal resources are located in Dagestan, the North Osetia, Ingushetia, Kabardino-Balkaria, Stavropol Krai and Krasnodar Krai.

However, assessment of practical application of these resources is complicated by the following factors:

- exploration of available geothermal resources and design of repumping of exhaust water require substantial time.
- repumping of exhaust water requires additional energy. Geothermal water is already used in Dagestan (residential heating). There are plans to use geothermal water in Kabardino-Balkaria and Krasnodar Krai (heating, greenhouses and pisciculture purposes).

Construction of geothermal heat and power stations requires substantial initial investments (see for example, the project of Stavropol Pilot Geothermal Power Station).

CONCLUSIONS:

1. Actual status of alternative power in the North Caucasus reflects its general status in the country. However, in May 2001, a decision was made at the governmental level on 20-fold intensification of use of alternative power in Russia, comparatively to earlier programs. In Rostov Oblast, the draft program was presented, stipulating developments in the sphere up to 2010.
2. Due to shortage of investment resources, it seems appropriate to mobilise finance resources of local budgets, individual enterprises and agriculture facilities.
3. It is necessary to establish a single co-ordination centre and delegate it some official powers.

PROBLEMS OF INVENTORY OF GHG EMISSIONS IN RUSSIA

G.Safonov, the High School of Economics

According to requirements of the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol to the Convention (1997), in order to participate in "flexibility" mechanisms (including trading in GHG emission quotas and joint implementation projects), Parties of the Convention must establish national GHG emission inventory systems, in compliance with recommendations of the Intergovernmental Panel of Experts on Climate Change (IPCC). This task belongs to the jurisdiction of the Federal Government, that is obliged to establish the National Inventory.

In 1994, the Inter-agency Commission on Climate Change was established with the State Committee for Hydrometeorology as the lead organisation. Composition of the Commission changed several times, in 1999, the Chairman of the State Committee for Hydrometeorology and the Deputy Minister for Economic Development and Trade of the Russian Federation were appointed co-chairmen of the Commission.

The Commission plays the key role in submission of inventory reports (GHG emissions and sinks) to the Secretariat of IPCC. However, the Commission is a co-ordinating body and has no finance resources of its own for development of efficient system for monitoring of GHG emissions and sinks.

Due to the above factors, in parallel with development of National GHG Inventory Reports of Russia (these reports are developed by the State Committee for Hydrometeorology and its subordinate Institute of Global Climate and Ecology), other agencies, companies and expert groups develop more detailed GHG inventories for separate industries, regions and facilities.

National Reports. The first National Report of Russia to IPCC was developed in 1995, with involvement of experts from the State Committee for Hydrometeorology, the Institute of Global Climate and Ecology and the Academy of Sciences of Russia). Their assessments of GHG emissions/sinks were based on published data of the State Committee for Statistics of the Russian Federation. The Report incorporated estimates of CO_2 and CH_4 emissions, and preliminary estimates of emissions of other greenhouse gases as at 1990. (see Table 1).

Table. 1. Anthropogenic emissions of greenhouse gases in Russia (1990)

Gases	Global warming potential (GWP)	Emissions in CO_2 equivalents	
		Emission, million tons of CO_2	A share in overall GHG emission (%)
CO_2	1.0	2387	72 %
CH_4	24.5	662	20 %
N_2O	320.0	262	8 %
TOTAL		3311	100 %

Source: 1st National Report of the Russian Federation under UNFCCC, 1995 (www.unfccc.ch).

The second National Report was developed in 1997-98. the Report contained more detailed information on GHG emissions/sinks in the base year (1990), and estimates for 1994 (see Table 2). The Report was developed in line with recommendation of IPCC guidelines of 1997.

Table 2. Anthropogenic emissions and sinks of greenhouse gases in Russia (1990 and 1994).

	1990	1994	
	million tons of CO_2 ed..	million tons of CO_2 eq.	% of 1990 levels.
CO_2	2372	1660	70%
CH_4	557	412	74%
N_2O	70	40	57%
Other GHG	40	40	100%
Total emissions	3039	2152	70%
CO_2 "net" sink in forests	392	568	145%

Source: 2nd National Report of the Russian Federation under UNFCCC, 1998 (www.unfccc.ch).

The first and the second National Reports are official documents on GHG emissions/sinks in Russia. The reports were submitted to the Secretariat of IPCC after their official approval by the Inter-agency Commission.

Further works, pertaining to national inventories of GHG emissions/sinks in Russia were (and are) implemented within the framework of Federal Focused Program "Prevention of Hazardous Climate Change and its Adverse Consequences". However, actual financing of the Program does not allow to carry out large-scale and detailed GHG inventories. As a result, only general estimates of GHG emissions/sinks are being made now.

Table. 3. Anthropogenic emissions and sinks of greenhouse gases in Russia (1990 and 1994-97).

	GHG emissions (million tons of CO_2 per annum)				
	1990	1994	1995	1996	1997
Burning and processing of primary fuel	2320	1640	1570	1480	1460
Industrial processes, Including:	46	24	23	19	18
Cement production	41	19	18	14	13
Aluminium production	5	5	5	5	5
Overall emissions	2370	1660	1590	1500	1480
"Net" sinks in forests	390	570	590	600	...

Source: preliminary estimates for 3rd National Report.

Sectoral inventories.

Power industry. In 1998-99, the Russian JS Co. "United Power Systems of Russia" (RAO-EES) conducted inventory of CO_2, CH_4 and N_2O emissions in power industry of the country (357 power plants) from 1990 to 1997. According to their assessments, emissions of these sources reached about 30% of gross national emissions of CO_2 (see Table 4).

The inventory of Russian JS Co. "United Power Systems of Russia" incorporates assessments of nation-wide CO_2 emission by different kinds of fuel (values of these factors differ from relevant average values, proposed by IPCC Updated Guidelines of 1996.

In 2000 - 2001, non-governmental non-profit organisation "Nature Protection" (USA) (Environmental Defence) and the Centre for Development and Implementation of Technical Assistance Projects carried out their independent expert assessment of the GHG Inventory of "United Power Systems of Russia". The expert assessments revealed high quality of the Inventory (for example, the preliminary estimate of deviation of CO_2 emissions reached about 4%, while the relevant figure of GHG Inventory of the British Petroleum reached about 20%).

Table 4. GHG emissions in power industry of Russia (1990 - 1997).

Gases	Emissions, million tons of CO_2 eq. per annum							
	1990	1991	1992	1993	1994	1995	1996	1997
CO_2	708.5	698.5	664.4	601.5	542.5	516.9	517.1	493.0
CH_4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
N_2O	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1

Source: Russian JS Co. "United Power Systems of Russia"

Coal industry. Another initiative for inventory of GHG emissions was implemented in the coal industry of Russia. Within the framework of joint GEF-UNDP project in Kuzbass, with participation of the Russian Methane Centre (Kemerovo) and US organisation IFC-Kaizer, methane emissions, associated with coal industry operations were assessed (see Table 5.)

Forestry. Assessment of carbon emissions and sinks in Russian forests is a fairly complicated task. We have some baseline information for these assessments (mainly due to results of periodical forest inventory works). However, so far, in some regions of Russia, forest inventory works fail to provide sufficiently accurate information for UNFCCC purposes.

The International Forest Institute is responsible for the major inventory works, associated with assessment of carbon emissions/sinks in Russian forests. Unfortunately, due to reorganisation of the Federal Forestry Service of Russia and its subordination to the Ministry for Natural Resources, now there is no official entity, responsible for inventory of carbon emissions/sinks in forests.

At the same time, available estimates suggest, that carbon exchange in Russian forests substantially exceeds anthropogenic GHG emissions. Therefore, it is clear, that it is necessary to intensify carbon inventories and development of measures to expand carbon sinks in Russian forests.

Table 5. Methane emissions of the Russian coal industry (million tons of CO_2 equivalent).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1998 % of 1990
Open cast coal mining	8.5	8.0	7.5	7.4	6.8	6.3	5.8	5.4	4.7	55.0 %
Underground coal mining	3.1	3.3	2.4	2.2	2.0	2.1	2.1	2.2	2.3	74.4 %
Gas utilisation	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	53.0 %
Further use of gas	3.1	2.4	2.5	2.3	2.1	2.1	2.0	1.8	1.7	53.7 %
Total	14.5	13.6	12.2	11.7	10.9	10.4	9.8	9.3	8.5	58.9 %

Source: the Russian Methane Centre (Kemerovo).

Regional inventories. Within the framework of the contemporary system for collection of statistical information in Russia, regions play the key role in GHG inventories. Therefore, at the stage of development of the national inventory system, it is necessary to focus on regional systems for collection and processing statistical data, pertaining to GHG emissions/sinks.

There is some positive experience of regional inventories of GHG emissions/sinks in Russia in line with the Updated IPCC Guidelines of 1996. For example, in 1999, GHG inventory was carried out in Novgorod Oblast; in 2000, GHG inventories were carried out in Cheliabinsk Oblast, Sakhalin Oblast, Arkghangelsk Oblast and the Republic of Khakassia. In 2001, inventories are planned for Nizhny Novgorod Oblast and Sverdlovsk Oblast.

Regional inventories of GHG emissions/sinks are of major importance for development of regional action programs for reduction of GHG emissions and expansion of GHG sinks and for implementation of regional policies for prevention of climate change. These issues are especially relevant for Russia, because many regions of the country are far larger than major European countries. However, so far the objective of development of a regional climate program for Russia have not been even suggested.

Problems, requiring further study:

- Development of an institutional entity, able to monitor GHG emissions/sinks efficiently;
- Development of strategies for GHG monitoring in regions and separate industries;
- Development of a methodological base for inventory of GHG emissions/sinks, in compliance with UNFCCC requirements;
- Financing for inventory, monitoring and registration of GHG emissions/sinks;
- Information dissemination and involvement of the general public into monitoring of activities, associated with implementation of UNFCCC provisions.

SUSTAINABLE ENERGY IN THE FOCUS OF ATTENTION OF NON-GOVERNMENTAL ORGANISATIONS

L. Popova, Socio-Ecological Union

There are numerous environmental non-governmental organisations in Russia, that are focused on federal and regional energy policies. Due to co-operation with the Centre for Safe Energy (a US organisation), the Centre for Nuclear Ecology and Energy Policy has managed to integrate about 20 regional group into the Sustainable Energy Network. Support of Swedish NGO - Swedish NGO Secretariat on Acid Rain - allowed us to maintain annual seminars on sustainable energy issues for several years. The seminars were focused on informing regional participants of the Network on climate change issues and policies. The Centre publishes its newsletter "Power Industry and Environment", that regularly covers climate change issues and the relevant negotiations. We got substantial assistance from the Centre for Energy Efficiency (Moscow), the Centre's experts have never refused to make high quality presentations to the seminar participants and distributed excellent background materials among them. The seminar participants actively discussed climate change issues and expressed their consolidated position, that implementation of energy efficiency and energy conservation measures should be among the key actions of Russia in the course of fulfilment of the international commitments under UNFCCC and Kyoto Protocol.

In the Soviet times, development of the national economy of Russia resulted in highest energy and resources intensity parameters per unit of output. Energy losses at generation, transmissions and use reach 40%, weight of Russian products usually exceeds weight of similar products of developed countries in 10 times. Improvement of energy efficiency is the best strategy for addressing climate change problems. In the years of reforms, emissions of carbon dioxide in Russian power industry and other industrial facilities decreased more than by 160 million tons of carbon equivalent, comparatively to 1990 (or by 40%). In Kyoto, Russia had managed to make very soft commitments - i.e. to stabilise CO_2 emissions at the level of 1990, in the period from 2008 to 2012. Expert assessments suggest that in the case of efficient energy use, CO_2 emissions in 2010 will be lower than the emissions level of 1990, notwithstanding simultaneous increase of GDP by 90%, comparatively to 1990. There are about 600 specific energy efficiency practices and technologies, available at national and international markets. If implemented, these practices and technologies may result in reduction of energy consumption by 20% (the decrease corresponds to reduction of CO_2 emissions by 70 - 85 million tons of carbon equivalent at unit price of $15 per 1 ton of reduction). Implementation of more expensive energy efficiency measures ($60 per 1 ton of carbon equivalent) would allow us to reduce energy consumption by another 15%, while 2/3 of energy efficiency capacity (of 220-280 million tons of carbon equivalent) might be utilised at costs, that would be by 10-30% lower, than corresponding investments into new power generating capacity.

Energy conservation is cheaper than development of new power supply sources. If costs of energy efficiency and energy conservation are compatible with costs of construction of new power sources, energy saving should be preferred. If these costs are lower, energy conservation is the best strategy, because it does not produce adverse environmental impacts, contrary to any source of energy, that affects the environment to a greater or lesser extent. Besides that, reduction of GHG emissions due to implementation of energy efficiency measures would be accompanied by reduction of emissions of other toxic substances and gases by power installation and industrial facilities. In 1995, Russian cities emitted 21 million tons of different air pollutants into the atmosphere, these emissions adversely affect human health, require higher spending on public health and environmental protection and make Russian cities less attractive to foreign investors. There are available technologies for modernisation of boilers and metallurgic plants, improvement

of transport and reduction of emissions of exhaust gases - all of them may contribute into addressing the problem.

Besides that, implementation of energy efficiency and energy conservation measures would improve quality of life, due to better living conditions, healthier outdoor air and lesser spending on medical preparations and health care. In contemporary Russia wealthy people start repairs of their flats and country houses from improvement of heat insulation, use of modern windows and modern, energy saving lighting devices, installation of water-saving plumbing fixtures, notwithstanding that their electricity and heating bills are not too high comparatively to their income.

According to official estimates, implementation of energy conservation measures and energy efficient technologies would allow to reduce consumption of fuel and electric power by 40 - 50%, (or 360 - 430 million tons of equivalent fuel) by 2020. About a third of the reduction might be generated in power and fuel industries, another third - in manufacturing industries, more than a quarter - in housing sector and utilities, 6 - 7% - in transport sector, and 3% - in agriculture. These technological measures should be supported by organisational ones. The latter measures may be subdivided into 3 groups:

1. low-cost measures, e.g. installation of measuring devices (counters), control of water and electricity consumption, replacement of equipment with excess operational capacity (equipment items will need replacement/modernisation at all events), reduction of fuel/electricity losses at transportation, accumulation and use;
2. medium-cost measures (provided reasonable payback time of projects);
3. complete technical modernisation of industrial facilities - in this case energy conservation and energy saving would be provided as additional effects; however, these measures would require structural changes in use materials (let us call it "dematerialization"), technologies and products.

Regardless specific forecasts of growing energy consumption in the course of renewal of the Russian economy, it is clear that first of all we need to use energy conservation and energy efficiency as the major energy resources. The Government realises it, as a result, in key governmental documents, energy conservation is declared as the priority issue of development of the national power industry. Federal Program "Energy Conservation in Russia for 1998 - 2005" was approved by the Government as early as in 1998. However, energy conservation and energy efficiency have not yet been applied broadly as energy resources. So far, these energy resources in Russia are used in the sphere of words, while it is the time to transform the words into deeds. In order to ensure successful implementation of the Program it is not enough to rise energy tariffs only, it is necessary to develop and introduce different economic and finance mechanisms, including:

1. Use of leasing schemes with delayed payments for installation of counters.
2. Issue of securities for energy conservation projects.
3. Establishment of regional energy conservation centres, based on higher investment components of energy tariffs' structure.
4. Provision of incentives for purchase of measuring equipment (based on tax reduction).
5. Promotion of installation of measuring equipment, due to introduction of differential end-user tariffs..

The Convention and Kyoto Protocol provide mechanisms for improvement of energy efficiency due to use of joint implementation projects. In the case of Russia, similar projects, especially at the regional level, may serve as a tool for mobilisation of investment for power industry. However, these project would require a system of reporting on reduction of GHG emissions due to implementation of the projects. It would be necessary to develop a scheme for accounting of

certified emission reductions, while provision of loans for certified emission reductions should be based on clearly defined responsibilities of the investor for final results achieved. Only under the above conditions, the environmental nature of the Convention and Kyoto Protocol will be preserved.

The Climate Action Network support transfer of technologies by countries of Annex II of the Convention with the aim to mitigate adverse consequences of the climate change and reduce GHG concentrations in the Earth atmosphere. However, there is an important reservation - "transfer of technologies should be interpreted as a component of the process of sustainable development, not as an instrument for creation of a market of obsolete technologies" (CAN Position Paper, COP6, La Hague, November 2000).

In the long process of negotiations, associated with the Convention and Kyoto Protocol, it became evident, that procedures for implementation of flexibility mechanisms lack transparency and accountability. Therefore, nobody can rule out a possibility of environmental or social damages in the course of implementation of particular projects. In order to accomplish objectives of environmental protection and sustainable development, declared by Agenda 21, it is necessary to ensure active public support and public involvement, which are impossible without the following preconditions:

- public access to information,
- substantive public participation in decision-making,
- access to justice, including legal protection and opportunities for compensation of damages.

Switch to energy efficient technologies and demand management methods would require from power producers and suppliers to work more closely with energy users. The increase of energy tariffs alone does not produce positive effects, but results in growing social tensions. In this case, non-governmental organisations may provide vital support, disseminating information on environmental, social and economic benefits of energy efficiency and energy conservation. As an example, we may remind the reform of housing and municipal sector in Russia - the failure to account for this factor has resulted in loss of several years.

CLIMATE CHANGE MITIGATION ACTIONS: NGO POSITION IN THE SPHERE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

O. Speranskaya, O. Ponizova, Eco-Accord Centre

Low public awareness and underestimated role of the general public in addressing the global warming issues resulted in inadequate involvement of Russian non-governmental organisations into development of policies for implementation of provisions of the United Nations Framework Convention of Climate Change and Kyoto Protocol. Eco-Accord Centre sought to improve this serious situation and involve as many NGOs as possible into discussion of these issues, providing them views of different organisations, that often had dramatically different positions.

A similar approach was used for preparation of seminar "Participation of Russia in Prevention of Global Climate Change" (Moscow, October 2000). Representatives of non-governmental organisations were provided opportunities to study the problem in detail, to identify priorities for actions, to declare their wish to participate in development of decisions for reduction of adverse impacts of climate change.

The range of the seminar participants incorporated representatives of international and Russian non-governmental organisations, actively and for a long time involved into global warming issues, including the World-wide Fund for Nature (WWF), GreenPeace, the Climate Action Network of NGOs (CAN), the Nature Protection Fund, the Centre for Development and Implementation of Technical Assistance Projects, the International Forest Institute. Besides that, experts of Russian governmental agencies also participated in the seminar (the State Committee for Hydrometeorology, the Ministry of Power Industry of the Russian Federation, the Committee for Environment of the State Duma). Representatives of Ukrainian non-governmental organisations were also invited to participate as observers (they reflected different points of view of two groups of NGOs of the republic).

Preparing the seminar, we did not intend to shape public opinion on climate change issues. We wanted to provide reliable information to non-governmental organisations, to assist them in sorting out the fairly complicated problem of global warming and to identify priority actions for mitigation of adverse consequence of climate change.

In many respects, objective of the seminar were met. The NGO coalition on climate change issues has been established. Now, the Coalition incorporates more than 20 organisations. The Coalition was established to ensure monitoring of decisions on implementation of the United Nations Framework Convention on Climate Change and Kyoto Protocol at the national level. While the Coalition is open for co-operation with all interested organisations, both governmental and non-governmental ones, its major aim is associated with independent monitoring of implementation of national policies in the sphere of global climate change, and their compliance with objectives of environmental protection and sustainable development.

Aims of the independent monitoring and improvement of co-operation within the community of Russian environmental NGOs were further promoted by the second seminar - "Climate Change Mitigation Actions: NGO Position in the Sphere of Energy Efficiency and Renewable Energy" (Moscow, June 2001). The seminar was initiated by Eco-Accord Centre and the Forum for Energy and Development (Denmark).

The seminar was attended by more than 70 representatives of Russian NGOs, ministries and agencies, dealing with global climate change issues, as well as by experts of "United Power

Systems of Russia" (RAO-EES), the Energy Ministry of Denmark, the Arctic Monitoring, "Nature Protection" NGO (USA) (Environmental Defence), etc.

Energy efficiency issues were discussed within the context of climate change problems as the first priority measures to mitigate global warming. Representatives of Russian NGOs were informed on inventories of greenhouse gases emissions in different regions of the country, on energy conservation and renewable energy projects, which are being developed and implemented in Denmark and Russia. Besides that, obstacles for implementation of renewable energy sources in Russia were also discussed.

The seminar was focused on assisting Russian NGOs in sorting out the complicated process of international negotiations on implementation of mechanisms of Kyoto Protocol, on discussing prospects of further development of power industry of the country and opportunities for application of renewable energy sources, as an alternative option to burning fossil fuels. Representatives of the Ministry of Power Industry, the Ministry for Economic Development and Trade of the Russian Federation and Russian JS Co. "United Power Systems of Russia" presented their vision of problems, associated with implementation of mechanisms of Kyoto Protocol. Experts of governmental and non-governmental organisations discussed energy conservation issues, compared energy efficiency and economy or Russia and other industrialised countries. Mr. Gunar Boye Olesen - representative of OVE-Europe, Danish organisation dealing with renewable energy sources - provided information on Danish initiatives and plans in the sphere of energy efficiency and renewable energy. Mr. John Nordbo, representing Group-92, the coalition of Danish environmental NGOs, pointed out the role of non-governmental organisations - members of the international Climate Action Network in addressing the global warning problems and their strong advocacy of the key issues of implementation of Kyoto mechanisms.

The seminar organisers succeeded in facilitating co-operation of Russian NGOs and representatives of governmental agencies. Russian NGOs supported efforts and actions of the Federal Government, aimed at improvement of energy efficiency and stressed importance of the following measures:

- **Introduction of strict governmental control over activities of power monopolies and ensuring transparency of the process for the general public;**
- **Increasing the share of high-tech industries in the national economy;**
- **Introduction of new energy efficient technologies;**
- **Development of new alternative sources of energy as a strategic option to address climate change problems (biomass fuel, solar power, wind power, geothermal power, etc.);**
- **Promotion of regional initiatives for use of alternative sources of energy.**

Similar joint actions of decisions-makers and the general public will facilitate settling of potential conflicts and reaching consensus on controversial issues.

We propose to your attention the results of the seminar, as well as the Action Plan of Russian non-governmental organisations, approved at the seminar. The non-governmental organisations are interested to participate in implementation of specific actions, designed for minimisation of adverse impacts of global climate change on the environment and human health.

WORKSHOP RESULTS:
"Taking Action on Climate Change: NGO Perspective On Energy Efficiency And Renewable Energy Sources"

Moscow, June 14-15, 2001

The workshop was organised by Eco-Accord with participation of Danish organisations Forum for Energy and Development, OVE-Europe, The Danish Organisation for Renewable Energy, as well as Centre for Projects Preparation and Implementation (CPPI).

Representatives of the following agencies and organisations spoke at the workshop: the RF Ministry of Economic Development and Trade, the RF Ministry of Power industry, CPPI, JSC "Unified Energy System (UES) of Russia", Energy Carbon Fund, Europe Research Institute of the Russian Academy of Sciences, Environmental Defence (USA), Centre Eco-Accord, Danish Energy Agency, "The 92 Group" (Coalition of Environment and Development organisations of Denmark), Danish organisation for Renewable Energy (OVE) / Forum for Energy & Development, Higher School of Economics, Centre of Environmental Investments of the Arkhangelsk Region, Institute of Global issues of Energy Efficiency and Ecology, Petrozavodsk State University, the Centre of Energy Efficiency, Environmental Defence, Socio-Ecological Union, Greenpeace and others.

Workshop participants outlined, that despite differences in opinions regarding causes, scale and implications of climate change, there is community of views at significance and urgency of actions aimed at improvement of energy efficiency, energy-saving and expansion of application of renewable energy sources (RES). These actions are effective means, which ensure limitation and reduction of greenhouse gas emissions. Realization of the UN Framework Convention on Climate Change and mechanisms of flexibility of Kyoto Protocol is an unique opportunity for the Russian Federation to attract investments in order to increase energy efficiency in corresponding sectors of the national economy, including housing and communal one. Mentioned documents are an example of economic approach to environmental problem solving, as "carbon" investments can lead to appearance of significant connected benefits, including:

- Reduction of pollutant emissions;
- Decrease in risk of public morbidity and ecosystem degradation;
- Implementation of scientific and technological achievements;
- Appearance of additional incentives in energy-saving;
- Development of alternative (renewable) environmentally sound technologies of power generation.

Participants of the workshop discussed a number of urgent issues connected with state and prospects of the Kyoto Protocol ratification, international negotiation process, realization of different tools of the Kyoto Protocol as well as issues of cooperation of Russia and Denmark and other European countries. The following issues have been mentioned among urgent issues, which Russia has to solve:

- Inefficiency of state system of environmental control;

- Insufficient involvement of general public in decision-making on environmentally sound issues;
- Lack of normative and regulative provision of valid participation of Russia in realization of the UN Framework Convention on Climate Change (FCCC) and the Kyoto Protocol;
- Lack of national legislation, which determines right of property for emissions. It is important to determine maximally possible volume of emissions in advance, as well as order of property and market structure.
- Lack of national mechanisms and procedures of negotiation/assignation/trading in quotas will not allow to implement many initiatives and projects of UNFCCC and Kyoto Protocol.
- Lack of national inventory system of greenhouse gas emissions.

The workshop participants emphasized significance of elaboration of legal regulations within the country, including:

- Normative and legal security of early use of the Kyoto Protocol mechanisms;
- Legislative acts, ensuring efficiency of early international co-operation within the framework of the Kyoto protocol;
- Legislative acts, ensuring direction of earnings derived from realization of the Kyoto protocol tools to environmentally sound projects aimed at subsequent reduction of greenhouse gas emissions.

Open round-table discussion on issues of establishment of state and independent registers took place within the framework of the workshop. Results of work based on the example of the USA National system of trading in quotas on sulfur oxide emissions were presented at the round-table.

Participants of the workshop listened to information on inventory results of greenhouse gas emissions in different regions of the country, as well as on projects on energy-saving and renewable energy sources, which are now being developed and implemented in Denmark and Russia. At the same time attendants of the workshop discussed problems, which hamper implementation of renewable energy sources and energy-saving technologies in Russia. In particular, they include the following:

- economic problems, which result in lack of both internal and foreign investments;
- unbalanced pattern of organic fuel prices;
- relatively high prices on special equipment for use of renewable energy sources, which is mainly determined by its short-run production;
- lack of access of general public to information on application technologies of renewable energy sources;
- lack of support, including government support, of development of alternative energy system at national and regional level;
- insufficient awareness of officials and managers, including private entrepreneurs, urban and rural population, on possibilities and advantages of use of renewable energy sources.

Participants of the workshop noted that main task of regional energy policy should be assurance of social and economic development of the region at any level on the basis of efficient, reliable and safe energy supply at minimal costs of production, conversion, transportation and consumption of energy resources.

Workshop participants supported efforts and measures taken by the Federal Government and regions, which were aimed at increase of efficient use of energy resources, and stressed importance of the following actions:

- Implementation of strict government control of activity of energy monopolies and ensuring of transparency of this process for general public;
- Increase of share of science intensive production in economy;
- Introduction of new energy-saving technologies;
- Development of new alternative sources of energy as a strategic solution of climate change problem: bio-fuel, solar, wind geothermal energy, etc.;
- Encouragement of regional initiatives on use of alternative energy sources.

Participants of the workshop appealed to Russian governmental structures and other organizations, that developed and made decision on issues of global climate change, to:

- Provide adequate representation of Russia at negotiations on climate;
- Confirm its adherence to the Kyoto protocol as a document reflecting political, economic, social and environmental interests of the country.
- Declare that Russia considers the Kyoto protocol as a main international document promoting attraction of additional investments in countries with economies in transition and developing countries.
- Debar from revision of the Kyoto protocol.
- Bring up an issue of ratification of the Kyoto protocol by the Russian legislation;
- Develop efficient national measures aimed at reduction of greenhouse gas emissions and a clear mechanism of international co-operation. It is necessary to underline importance of joint work in the field of energy efficiency, energy-saving and conversion to renewable energy sources.
- Elaborate an action plan on implementation of all three mechanisms of flexibility of Kyoto protocol.
- Announce at the top level that the Russian Federation assumes obligations to develop a mechanism of target application of funds earned within the framework of flexible mechanisms of Kyoto protocol for realization of certain projects in the field of energy efficiency and environmental protection, including projects aimed at education of general public on issues of global climate change and its implications;
- Ensure transparency of the application of funds obtained in the result of implementation of the Kyoto protocol mechanisms;
- Guarantee effective public participation in activities connected with implementation of the Kyoto protocol and negotiations on the Kyoto treaty, including elaboration of the policy, development of legislation, specific plans, programs and projects. To ensure complete and timely informing of all interested public groups, to provide opportunities to express their opinions and to make sure that their opinions will be taken into consideration while decision-making.
- Establish an independent structure, which will ensure registration of deals made within the framework of Kyoto protocol and transparency of financial flows, to make its work clear for the public and sponsoring agencies.
- Resume work of Inter-departmental commission on climate issues and make its work transparent for the public;

- Ensure participation of the Russian Federation in the work of Experimental Carbon Fund, which was established according to the initiative of the World Bank;
- Support regional initiatives on implementation of pilot projects within the framework of the Kyoto protocol, in particular, projects in the field of energy efficiency, use of alternative energy sources and inventory of greenhouse gas emissions.

Participants of the workshop stressed importance of the following actions for all states-signatories of the UN Framework Convention on Climate Change:

- To ratify the Kyoto protocol before the beginning of the World Summit on Sustainable Development (Johannesburg, August 2002).
- To secure international cooperation in the field of increase of energy efficiency and development of technologies of renewable energy sources;
- Support and develop programs on transfer of technologies of use of renewable energy sources, to guarantee free choice of environmentally friendly technologies;
- Ensure transparency of application of funds derived from realization of flexible mechanisms of the Kyoto protocol.

ACTION PLAN OF RUSSIAN PUBLIC ORGANISATIONS

An **Action plan of Russian public organizations** interested in participation in performance of specific tasks aimed at minimization of implications of global climate change impact on state of environment and public health was elaborated on the basis of the workshop results. It includes the following key statements:

1. To participate in specific activities on expansion of possibility to develop renewable energy sources in regions of Russia.
2. To carry out information campaigns among broad public circles, which are aimed at coverage of issues connected with:
   - development of renewable energy sources;
   - realization of energy-saving projects and technologies;
   - implementation of projects aimed at reduction of greenhouse gas emissions.
3. To promote wide informing of general public on the course of realization of the Energy Strategy of Russia, to conduct public monitoring of implementation of the Strategy regulations.
4. To promote transparency of the restructuring process in enterprises of the JSC "UES of Russia" (RAO-EES), which is responsible for energy safety of Russians: to hold public hearings and meetings with representatives of the JSC "UES of Russia", to distribute press-releases in order to guarantee taking public opinion into account during the restructuring process.
5. To promote wide study of essence of the Russian Federation's Energy Strategy by the society in order to establish compliance of the Strategy regulations with interests of the society and sustainable development of the country.
6. To promote achievement of open and equal public access to information on greenhouse gas emissions, deals on trading in quotas and projects of joint implementation; to reach clarity of information on formation and spending of funds obtained in the result of implementation of flexible mechanisms of the Kyoto protocol.
7. To distribute information materials on monitoring of the process of fulfilling obligations on reduction of greenhouse gas emissions by Russia and other countries; to form public opinion on necessity of implementation of flexible mechanisms of the Kyoto protocol.

8. To participate in projects on inventory, monitoring, registration and verification of greenhouse gas emissions in Russia;
9. To promote establishment of the dialogue among different sectors of the society for open discussion of positive and negative aspects of trade in quotas on greenhouse gas emissions, to pay special attention to the dialogue among representatives of business, industry, governmental environmental agencies and general public.
10. To vitalize the conduction of public environmental expertise and EIA procedures in order to control projects of joint implementation, aimed at reduction of greenhouse gas emissions as well as commercial deals on trading in quotas on greenhouse gas emissions. To initiate conduction of public hearings and public opinion polls.

The Danish and Russian NGOs agree to continue co-operation. The Danish NGOs will, as much as they are able to it, assist the Russian NGOs in the above ten points. I addition Russian and Danish NGOs will continue the dialogue on climate and energy that was started with the above mentioned workshops and project.

ECO-ACCORD CENTRE

The centre was founded in 1992 as a non-governmental, non-profit organisation of citizens of the Russian Federation. Founders of the Centre were graduates of different departments of Moscow State University, for whom environmental and sustainable development problems became priorities of their public and research activities.

THE MAJOR AIM OF THE CENTRE – ***to facilitate transition to sustainable development by:***

- seeking new approaches to address environmental, economic and social problems at the global, national and local levels;
- public awareness raising on issues of development and survival of the humankind.

KEY ACTIVITIES AND MAJOR RESULTS: .

- The Centre participates in ***development of environmental policies*** at the national, international and local levels. In particular, activists of the Centre participated in development of the Environmental Action Program for Central and Eastern Europe. Now the Centre is actively engaged in its implementation. The Centre initiated and co-ordinated development of the Alternative Environmental Action Plan of the Russian Federation, with participation of 49 non-governmental organisations.
- The Centre is engaged in seeking ways for transition ***to sustainable development***, and monitoring of implementation of Agenda 21 in Russia and globally. The report, developed by the Centre, won the contest for the best model for transition of Russia to sustainable development in October 1994. The Centre conducted the range of roundtables, seminars and discussions on relevant issues of sustainable development - results of these events were submitted, in particular, to governmental agencies of Russia and the UN Commission on Sustainable Development. Now, the Centre co-ordinates development of the report on progress of Russia in the sphere of sustainable development after the United Nations Conference on Environment and Development (Rio-92).
- Eco-Accord is actively engaged into ***enhancement of public participation in decision-making on matters of environmental significance*** - in particular, on issues, pertaining to Russia's accedence to UN ECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice of Environmental Matters; on improvement of the system of public participation in the sphere.
- ***Information-dissemination activities*** of the Centre incorporate - its Internet news-server "Eco-Accord Informs...", covering activities of different organisation in the sphere of environment and sustainable development, production of TV documentaries, development of TV and radio programs, posters, brochures and other awareness raising materials, dedicated to different aspects of environmental protection.

Eco-Accord actively participates in international co-operation processes, including Environment for Europe and Health and Environment. The Centre is accredited at the UN Commission on Sustainable Development and actively participates in its operations, as well as in preparation to the Global Summit on Sustainable Development (Johannesburg, 2002).

Eco-Accord Centre
Russia, Moscow, 129090, PO Box 43; phone/fax: 095-925-9282;

Forum for Energy and Development (FED)

Is a Danish non-governmental umbrella organisation established in 1992. FED is a centre for dialogue and cooperation between popular organisations engaged in energy environment and social development.

FED works to encourage the use of sustainable energy in social development around the world. It does so by enhancing the capacity of local communities to utilise renewable energy in a sustainable way.

The organisation is an influential spokesman for sustainable energy in national and global decision-making concerning social development.

Purpose

The overall aim for Forum for Energy and Development is to promote sustainable energy world-wide. Sustainable energy is defined as social development based on rational use of energy, renewable energy sources and energy savings.

Intermediate aims in working for the organisational purpose are to:

enhance global cooperation between industrialized and developing countries and, as part of that, enhance cross-border mediation of experiences;
enhance cooperation between democratic organisations engaged in energy, environment and development;
contribute to public enlightenment in Denmark concerning the organisational purpose and related areas of interest;
influence national and international donor organisations to give priority to sustainable energy.

The practical tasks of FED are mainly to:
support integration of sustainable energy in Danish and international development programmes;
support integration of sustainable energy in the programmes of member organisations;
prepare and implement awareness campaigns, focusing on sustainable energy in an environmental and social context;
influence global and national agendas.

National and Global Agenda

FED has by now reached remarkable results in ranking sustainable energy high on the political agenda for Danish development assistance. Hence, the future work will concentrate on follow-up activities to secure realization of the political intentions.

On the international agenda, FED works mainly through INFORSE to accelerate decision-making in favour of sustainable energy. As a minimum, it is vital to prevent achieved agreements from being diluted in the implementation process.

FED works in established political fora - mainly the Climate Convention, the Desertification Convention and the Commission for Sustainable Energy in the year 2001

Address:
Blegdamsvej 4 B, 1.
DK-2200 Copenhagen N, Denmark
Phone: +45 3524 7700, Fax: +45 3524 7717
E-mail: info@inforse.org, web: www.energiudvikling.dk

OVE, The Danish Organisation for Renewable Energy

OVE is a non-governmental, non-profit association of 3,000 Danish individual and institutional members. OVE was founded in 1975.

Objectives

OVE has a strong engagement:

- to influence the development of the Danish and European Energy Policy to be more resource- and environment-conscious especially by facilitating the use of renewable energy.
- to get the people informed of their possibilities to make their own action by installing renewable energy systems in their own homes or institutions in Denmark.

OVE's Activities in Denmark:

Political Lobbying:

- Seeking to be represented in the energy related law and regulation formulating processes through hearings and committees. OVE is active member of the Danish Energy Agency's Solar Energy Committee
- Evaluating and producing policy and campaign papers on renewable energy issues.

Information Dissemination:

- Publishing a Danish bi-monthly magazine "Renewable Energy and Environment" in Danish for the members.
- Offering a homepage with keys to literature, demonstration plants, companies and other relevant sites on the internet (http://www.orgVE.dk)
- Participating in exhibitions, organising seminars, courses and teach-ins in close co-operation with the Local Energy and Environmental Offices (http://www.sek.dk).
- Promoting information campaigns and services in a close co-operation with Local Energy and Environmental Offices e.g., the "Campaign for converting houses from electric heating systems into more environmental friendly energy sources like renewable energy".
- Involved in the Energy Forum of Schools aiming to implement more and better education on energy and environmental matters. (http//www.sef.dk).
- Organising meetings at which technicians and users share knowledge and experiences. The main topics discussed are windpower, solar energy, biogas, energy efficiency, and renewable energy in green cities, along with integration of renewable energy in to energy systems such as those for local cogeneration of heat and power

Advising:

Providing expertise to promote environmentally benign uses of alternative energy sources and related technologies.

Co-operation in Denmark:

OVE has gone into co-operation with many other organisations interested in energy in Denmark. This includes environmental organisations, trade unions, the Council of Small and Medium Sized Companies, Co-operating Energy and Environment Offices (http://www.sek.dk/), the Danish Folkecenter for Renewable Energy (http:// www.folkecentre.dk/), and urban ecology groups. OVE is member of the Danish NGO network, Forum for Energy and Development (FED) (http://www.inforse.org).

OVE's Activities in Europe (OVE-Europe):

International Networking: OVE plays a significant role in international networking among NGOs. OVE is member of:

CNE, Climate Network Europe, a NGO Network with a Secretariat based in Brussels, Belgium. (http://www.climatenetwork.org/

INFORSE, International Network for Sustainable Energy, a NGO network with its International Secretariat based in Denmark and with 7 Regional Co-ordinators in different continents. (http://www.inforse.org/)

European ECO-forum Pan-European network of NGOs on environment (http://www.eco-forum.org)

OVE-Europe follows the EU's energy policy, participates in the work of the above mentioned international NGO networks and co-ordinates the EU-Forum of Danish NGOs working for energy and environment.

European NGO Seminars

Since 1989, OVE has organised European NGO Seminars on renewable energy and energy efficiency. The aim of this series of meetings is to exchange information and to enhance co-operation between the active popular organisations in Europe. In 1998, it was organised together with the ECO-forum parallel to the Århus European Environmental Ministers Meeting.

Contacts adresses:

Activities in Denmark:

OVE National Secretariat
Dannebrogsgade 8
8000 Aarhus N, Denmark
ph+45-86760444
fax+45-86760544
email: ove@orgve.dk

Activities in Europe:

OVE-Europe
Gl. Kirkevej 56
8530 Hjortshoej, Denmark
ph+45-86227000
fax+45-86227096
email: ove@inforse.org

Activities in Asia and Africa:

OVE International
Dannebrogsgade 8
8000 Aarhus N, Denmark
ph+45-86760444
fax+45-86760544
tobiesen@orgve.dk

Website: www.orgve.dk