INTOSAI
Working Group
on Environmental
Auditing

DRAFT

Auditing the SUSTAINABLE ENERGY

Guidance for Supreme Audit Institutions

CONTENT

Preface

The transition from a largely fossil fuel dependant global economy to a renewable energy fuelled world ranks among the 21st century's major challenges, for the following reasons:

- Recent years can be characterized as a period during which the era of relatively inexpensive, easily obtainable fuels has come to a close. Ranking among the indicators most closely watched worldwide is the price of crude oil, which is indicative of the prices of energies. Linked to crude oil prices, the prices of natural gas and, electricity are also subject to change.
- Rising energy prices, accompanied by periodic price shocks and geopolitical conflicts, have shown how important the role of energy is to economic growth and to the development of society. The world's reliance on fossil fuels has impacted upon the natural environment and climatic system. According to the Intergovernmental Panel on Climate Change (IPCC), greenhouse gas emissions have already brought about a global mean surface temperature increase of 0.6 degree Celsius and a mean sea level rise of 10 centimetres. Unless appropriate steps are taken, all regions of the world will face serious consequences to their economies and ecosystems alike.
- Energy security is a growing issue for both developing countries as well as OECD countries, which continue to be dependent on energy imports. Many countries are unable to meet current energy demands with domestic energy sources. Concentrating crude oil production in a small group of countries with large reserves will further increase their dominance on the market and bolster their capacity to increase fuel prices. At the same time, some of these imports come from politically unstable regions.

The issue of renewable energy has not been audited extensively by the supreme audit institutions The Czech Supreme Audit Office has considerable experience with audits conducted in this area and has accepted the role of the project leader– for the Sustainable Energy guidance.

It is part of the Goal 1 of INTOSAI WGEA Work Plan for 2008-2010, which aims to expand the amount of methodological materials that could be sourced by the audit institutions. Therefore, as an output of this project, the document has been designed to serve as an aid in conducting audits focused on renewable energy resources. In order that the document can be of use to all INTOSAI members, it is of a general character and has been drafted in English.

The guidance has been written to

- Provide useful background information on renewable energy sources;
- clarify the terms relating to renewables;
- be of assistance to auditors active in the area of auditing renewable resources of energy, with practical examples of how the audit criteria and audit criteria should be chosen;
- demonstrate case studies of renewable energy audits carried out by various supreme audit institutions all around the world.

Together with the Supreme Audit Office, there were other participants in this project - including the supreme audit institutions of Australia, Brazil, China, India, Kuwait, Morocco, Norway, Poland, United Kingdom, Vietnam, and Zimbabwe. Valuable assistance was also provided by the supreme audit institution of Canada.

We wish to express our sincere thanks to all our co-workers, while to the readers of this guidance we wish much success in its application in practical auditing.

Executive Summary

will be completed later on

Introduction

This document is entitled 'Sustainable Energy' which can be defined as:

Sustainable energy is the provision of energy such that it meets the needs of the present without compromising the ability of future generations to meet their needs. A broader interpretation may allow inclusion of fossil fuels and nuclear fission as transitional sources while technology develops, as long as new sources are developed for future generations to use. A narrower interpretation includes only energy sources which are not expected to be depleted in a time frame relevant to the human race.

Thus, with the narrower interpretation we understand by this term is the renewable, resource of energy, represented by wind energy, solar energy, geothermal energy, water (hydro) energy, biomass energy, energy of the gases generated at waste dumpsites, energy of sludge-derived gas, energy of bio-gas and energy of mine gases.

As regards the future of the energy sector, the world has arrived at a crossroads. Twenty years ago, the RERs were merely a vague vision, while today they are becoming a viable alternative to fossil fuel based energy.

Increasingly countries are seeking measures to increase the share of renewables in their energy mix. The broader use of renewable resources will make it possible to

- move towards a new subsector based on modern technologies;
- alleviate our dependency on energy imports from less stable countries;
- mitigate atmospheric pollution;
- cut down reduce the consumption of fossil fuels and uranium; and
- generate new jobs.

However, there are a number of obstacles which can hinder progress towards a broader utilization of RERs, including:

- inadequate and imprecise legislation/policy;
- high costs for developing, installing and operating renewable energy technologies;
- a poorly functioning system of state subsidies for developing and supporting RERs;
- insufficient competitiveness of renewable energy;
- poor awareness on the part of those who could be using RERs; and

- insufficient competitiveness of energy from RERs;
- scepticism of investors and consumers in RERs.

Public funding may be used to promote and develop the renewable energy sector, through direct funding, through research in addition to supporting technology development. It is necessary to review and audit both the management of spending from public funds and the effectiveness of policies and programs in achieving its stated objectives.

This document, which is to assist audits focused on sustainable energy, is broken down into three sections devoted to three topics:

Chapter One presents the basic data on energy, conventional and unconventional generation of energy, the advantages and drawbacks and in some cases, also the barriers hindering the introduction of different kinds of energy, and the various existing energy policies and energy policy instruments.

Chapter Two is focused on the area of energy savings, on energy consumption (thermal and electric energy and the transport or transmission thereof), and on the tools available for raising the energy efficiency, including the material definitions of the areas requiring audits by the supreme audit institutions commensurate with their mandates.

Chapter Three gives a step-by-step description of the process whereby the topic for auditing and the audit priorities are chosen, of the decision-making involved in tackling the task of auditing (the objectives of audits and questionnaire surveys), as well as of the ways of picking the potential audit criteria and instruments, and of approaching risk analyses.

Moreover, the publication is supplemented by **case studies** - audits that have already been successfully completed, to be presented in the form of tables so as to provide illustrative examples.

International aspects and commitments

Dynamic development of industrial production has generated growing demands for energy and has highlighted the problem of sufficiency and availability of accessible energy resources. The dependency of many countries on energy-generating raw materials has become a dominant problem in both economic and political spheres. Energy-related issues have emerged as one of the fundamental priorities to focus on when implementing the principles of sustainable development.

The most significant international agreements that impact upon the current and future use of RERs, are presented in the following section.

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the United Nations Conference on Environment and Development held in June, 1992. The Framework Convention stipulates a number of general commitments and rules to be observed by the signatory countries. These include:

- generating national programs to mitigate the adverse impacts of climate change and updating these programs regularly;
- formulating adaptation strategies;
- supporting sustainable systems of managing the economy and systems of nature conservation;
- monitoring, on a regular basis, the national volumes of emissions of greenhouse gases released into the atmosphere, and monitoring the pollution caused thereby;
- taking account, as a matter of responsibility, of the risks associated with the impacts of climate change when adopting social, economic, and environmental measures, and minimizing such risks; and
- supporting international cooperation in science and technology and supporting educational and training programs as well as programs geared to information exchange.

Following from the UNFCCC the Kyoto Protocol was adopted in 1997 and has been in force since 2005. The protocol represents an international agreement that sets out binding targets for greenhouse gas (GHG) emissions for the European Community and for 37 other countries. The overall aim was to achieve a 5 % reduction in GHG emissions compared to the 1990 levels during the five-year period of 2008-2012. The countries that are bound by the Kyoto Protocol to reduce their greenhouse gas emissions have to achieve their respective targets mainly by adopting measures at the national level. Other ways of attaining these objectives include three commercially based mechanisms stipulated in the Kyoto Protocol:

- trading in emission permits;
- the clean development mechanism (a mechanism which allows advanced countries to claim emissions credits by investing in emission abatement projects in developing countries); and
- the mechanism of introducing joint measures of emissions abatement (funding of projects that would truly mitigate the existing greenhouse gases emissions).

These mechanisms aim to create a world-wide „carbon market“.

International recognition of global energy security and supply issues were also among the central topics of the World Summit on Sustainable Development, held in 2002 in Johannesburg. The main results of this conference included the signing of a political declaration. This declaration laid down a number of principles regarding sustainable development, and approved an Implementation Plan which presents a detailed roadmap toward achieving sustainable development at the international, national, and local levels. Among other things, the approved Implementation Plan is focused on renewable or at least cleaner energy resources. Its objective is to substantially raise the global share of renewable energy resources (however, without indicating any time schedule for introducing the renewables).

Negotiations of the signatory parties of the UNFCCC and of the Kyoto Protocol were held in 2007 in Bali, Indonesia. The conference culminated in the development of the so-called Bali Roadmap, which set out the time framework and defined the scope of the issues to be negotiated during the next two years. The conference also recognized the projections and conclusions made by the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report (2007). The report summarizes climate change estimates and, simultaneously, offers a scientific, technical, and socio-economic outlook for the important related topics. The Bali roadmap resolution was approved by all delegations, including the United States of America. These negotiations will continue and culminate at a conference of signatory parties to be held in December 2009 in Copenhagen where it is hoped that an international agreement will be reached on a further round of emissions reductions to succeed the first commitment period of the Kyoto Protocol which will have expired in 2012.

Chapter 1

The chapter outlines the basic sources of energy, including fossil fuels, nuclear energy and renewable energy sources. Subsequent sections of this Chapter are focused on energy generation trends, on energy transmission over the distribution networks and the hydrogen economy. At the end, there is a general overview of potential and current methods of supporting the production of energy from renewable sources.

1.1 Energy sources

1.1.1 Fossil fuels

Fossil fuels are raw materials that took millions of years to form by anaerobic transformation of dead organisms. They release the energy contained therein mainly by combustion. Fossil fuels include coal, natural gas, and crude oil. Traditionally, they are classified as solid-state (coal, peat), liquid-state (oil), and gaseous fuels (natural gas). The heat generated by their combustion is used for direct heating or for the generation of electric power. Fossil fuels as sources of energy are not renewable, since their reserves are limited. They take up the greatest share in the global production of energy. Modern technologies strive for increased efficiency in the generation of energy from fossil fuels.

The advantages of using fossil fuels include the existence of adequate technologies, the availability of infrastructures permitting their widespread use a developed power transmission grid. In the case of liquid and gaseous fuels, easy transport indisputably constitutes an additional advantage.

Fossil fuels also have various drawbacks. The most significant of the latter are the facts that reliance on fossil fuels lowers the energy security[1] of some countries (in those countries which do not have significant reserves) and their use causes pollution of the environment, including the following:

- air pollution
- generation of dangerous wastes, produced by their combustion;
- extraction of raw materials and their haulage over great distances.

[1] *Note: - energy security amounts to reducing and diversifying the country's dependency on the supplies of energy-generating raw materials or of electric power; a more detailed definition can be found in the Glossary.*

1.1.2 Nuclear energy

Nuclear power stations generate electricity technically in the same way that stationary fossil fuel burning does. It is the source of fuel that makes the difference - in the case of nuclear power stations it is uranium. The thermal energy is released in a controlled fissile reaction taking place in the nuclear reactor. Currently there are 30 countries of the world that operate nuclear power stations. These generate about 14 % of global electricity production.

From the environmental aspect, nuclear energy possesses the advantage that the nuclear power plants are regarded as generally accredited sources of electric power, inasmuch as their operation does not produce emissions released to the atmosphere. A nuclear power plant compared to a power plant burning fossil fuels consumes a relatively small quantity of primary fuel.

On the other hand, nuclear power generation produces radioactive wastes and, thus, increases the risk of contamination due to imperfect storage of irradiated fuel. Critics of this kind of energy generation also mention the potential dangers to the population from accidents at nuclear power plants.

1.1.3 Renewable energy resources

Renewables include biomass energy, gases from wastesites and wastewater treatment plants, wind, solar and geothermal energy, and hydropower including wave energy and tidal energy. Definitions of renewable energy vary from country to country, and also that every country holds its own opinion about what kinds of energy resources should be included among renewables. Current practice shows that the capacity of renewable energy resources continues to be under-exploited.

Renewables contribute to the sustainable development of the energy sector. Their advantages are that they can be environment-friendly and they are locally produced and so can increase energy security by reducing countries' dependency on foreign imports.

However, renewable energy sources also have their drawbacks. The most significant ones are mentioned separately for each type of renewable.

1.1.3.1 Biomass

Biomass can be used for heating and water heating, as well as for electric power generation and for transport. Specific vegetable species, secondary products, or wastes are used for the purpose of energy generation. Biomass can be a source of biogas, e.g. from waste site gases.

The basic breakdown of the various types of biomass is by their water content:

- *dry biomass* – wood and waste wood, straw, and other dry residues from the production of agricultural crops, etc.;
- *wet biomass* - liquid wastes from farming, liquid municipal wastes and refuse. It does not lend itself to direct combustion, and is used especially in biogas technologies;
- *special biomass* – including oil-plants and oleaginous plants, as well as starch and sugar containing matter used to produce biofuels.

Biomass can be also transformed to Biofuels which can be used in transportation. Biofuels for transport represent an alternative to fuels produced from fossil resources. The starting material for the production of bio-diesel fuel is oil seeds, while bioethanol is produced from plant sugars obtained for example from sugar cane or cereals.

Using biomass as a renewable source of energy has two potential disadvantages. The growing of biomass crops may displace agricultural land normally used for growing crops for food making food more scarce and affecting the foodstuffs market or it may displace forests and contribute to soil erosion. Also combustion of some biofuels can release a high amount of air pollutants to the atmosphere.

The production of second-generation biofuels is planned, where the whole plant or any residual parts of plants become a source for biofuels' production. This will reduce the extent to which the growing of biomass crops displaces arable land.

1.1.3.2 Hydropower

The energy of water can be used to generate electric power thanks to water motion (usually, at river dams) or to convert it to mechanical energy by direct transformation. Energy is captured by water wheels or hydraulic turbines placed within the waterfall or water stream.

Tidal energy makes use of the regularity of tides to generate energy by placing turbines in the direction of the incoming high tide stream or by erecting dams or constructing lagoons.

Wave energy (combining the forces of wind and water) can be tapped by placing buoys in the pathway of the water waves. Motion of the buoys generates energy.

Recently, projects have become more frequent where compact hydroelectric power stations are built, since even smaller water streams can be tapped for energy generation thanks to the microturbine technology.

Even though water energy ranks among the most widely used renewable energy resources, it also has considerable drawbacks. Hydroelectric power stations are characterized by high investment costs, particularly in case of large hydro stations, and this goes hand in hand with environmental impacts from the building of the stations and the impact on water levels and flow. The amounts of energy generated also depend on seasonal water flow rate fluctuations.

Tidal power stations also suffer from another disadvantage: their operational hours cannot be varied and so cannot be matched to the energy peak times of the electrification grids. The sites well-suited for the construction of these power stations are also often remote from the points of consumption of the energy produced.

Using the energy of sea waves also has its negative aspects. Here the potential is great indeed, but depends on the force of wind.

1.1.3.3 Wind energy

Wind is air in motion caused by unequal heating of the earth's surface, and represents the horizontal component of moving air. Rotors of turbines driven by streaming air can be used to generate energy. The size of the turbines may be anywhere from small simple turbines fitted onto the roofs of family homes up to individual large turbines and wind farms. Wind energy is easy to convert to electric power and does not generate emissions or waste. Electric power from large installations is fed directly to the grid, while small units (e.g. house wind power plants) may serve as local sources of supply.

The main problems of wind turbines include high investment costs (especially for offshore wind) and unpredictable intermittency of the output. Reservations have also been voiced regarding the noise generated by the turbines, the aesthetic look of the masts and propellers and the impact on military radar. The intermittency of the energy generated by wind power can require other energy sources to be used as backup, e.g. fossil fuels power plants.

1.1.3.4 Solar energy

Energy deriving from the sun can be utilized in two ways. Its passive use is of advantage in that no further equipment is needed. This is how solar radiation passing glass panes or specially adapted facades and roofs of buildings can be put to use. There are a variety of commercial devices and installations to support active utilization of solar energy - in particular, photothermic or photovoltaic panels and systems. The photothermic panels (collectors) are used mainly for local hot water heating or for heating process/service water. The photovoltaic cells serve to directly convert incident solar radiation to electricity.

The indisputable advantage of solar energy is its zero emissions and waste production.

Solar energy suffers from the disadvantage that its production has to conform to the alternation of day and night and that the intensity of sunlight varies during the course of the day and through the year. To store the energy generated requires costly storage batteries - alternatively conventional sources are needed on standby. In order to allow for large-scale utilization of solar energy, it will be necessary to develop new, higher-efficiency types of equipment that can be manufactured at lower costs.

1.1.3.5 Geothermal energy

Geothermal energy is the energy obtained directly from the heat stored deep underground in the form of hot rock, hot water or steam. Power stations using geothermal energy are often built in volcanic regions where their turbines are driven by hot steam rising from geysers and hot springs at elevated pressure; alternatively, use is made of a heat-absorbing medium pumped into boreholes to heat up in the earth's interior whence it is then pumped back to the surface. The heat stored underground can also be tapped by means of heat pumps although to a lesser extent.

The potential for using geothermal energy is limited from the geographical viewpoint, since it is available only in certain geologically appropriate locations.

1.2 The power transmission grid

Energy generation is only one issue which has to be taken into consideration in the framework of sustainable energy. An issue of substance is also energy transmission to end users.

The transmission networks impose limitations on the transmission of energy. Present transmission networks used for long-distance energy transmission generally operate with voltage of 400 – 1200 V. Transmission over greater distances can cause electric power losses, so that power transport becomes uneconomical. Transmission losses particularly affect certain types of renewable sources of energy which generate electricity a long way from where it is used, such as wind power stations, seaside regions tidal power stations, solar power plants in desert areas etc. These losses may mean that small-sized, remote power sources are not economic. The cost of connecting renewable energy sources to the distribution network must also be included and may make investment uneconomic.

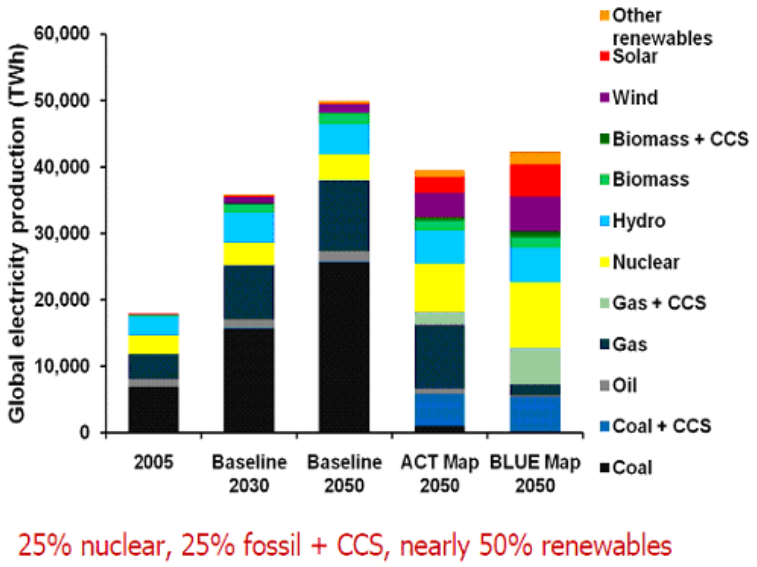
There also exist alternative methods like hydrogen economy, wireless energy distribution etc.

1.3 Trends in energy generation

The world is facing many challenges in dealing with the ever-growing demand for energy. The present-day energy generation system is influenced not only by advanced economies but also by the rapid growth of less developed countries.

Unless governments alter their attitude to their respective energy policies, in particular the use of fossil fuels, greenhouse gas emissions will keep rising at a constant or even an accelerating pace, thus impacting the world energy safety and speeding up climate change. Without a change to current energy policies, world energy consumption by 2030 will be twice that of today.

Graph no. 3: Electric power generation

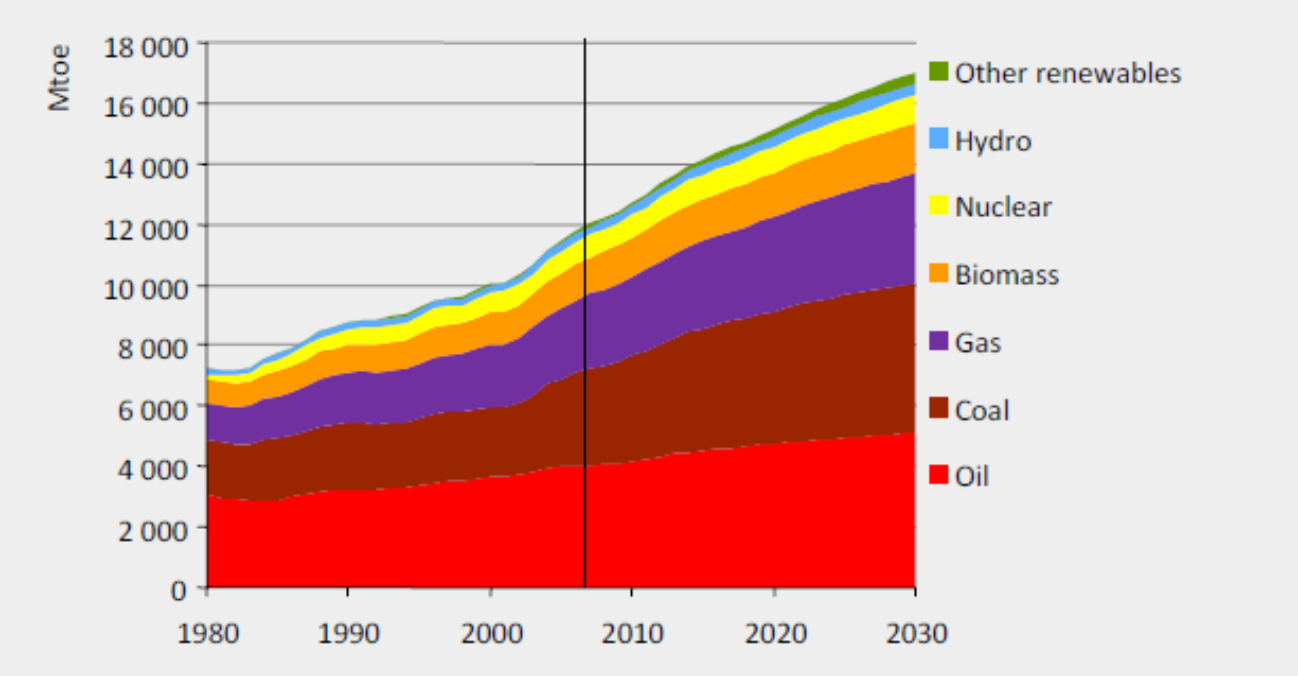


Source: International Energy Agency, World Energy Outlook 2008

Note: CCS – Carbon Capture and Storage

At present, fossil fuels (oil, gas, and coal) represent the main worldwide source of energy generated. Greater growth of fossil fuels consumption in connection with energy generation is primarily in non-OECD countries. From fossil fuels, coal has shown the greatest growth of consumption, followed by oil and gas. Increased fossil fuels consumption is shown in its lower accessibility and higher prices. According to the International Energy Agency's scenario, seen in Graph 3, oil is bound to remain the most important source of energy worldwide for a number of years to come. This prediction includes an optimistic variant of rising energy generation from RERs. It also possible to presume, RERs will not become a worldwide majority energy source.

Graph no. 4: World demand for energy according to the basic Reference Scenario



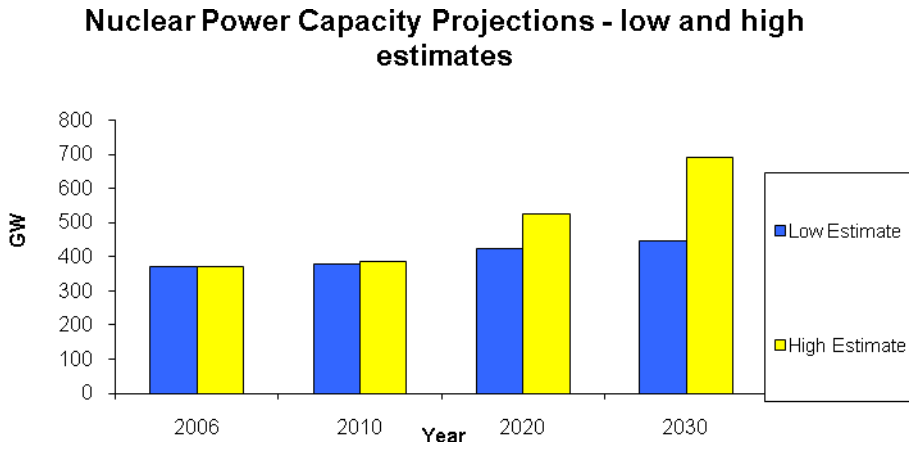
Source: International Energy Agency, World Energy Outlook 2008

Graph no 4 presents IEA projections of future trends in energy demand up to 2030. As long as the IEA Scenario will be met in the future, the situation will became unsustainable (in 30 – 50 years) from both environmental and socioeconomic point of view.

Furthermore, the projections of nuclear energy demand and generation also raise challenging environmental and socio-ethical concerns. There has been a growing interest in recent years in nuclear energy generation which can also be included into the Scenario.

Graph no 5 presents low and high estimates of global nuclear power capacity.

Graph no. 5: Low and high nuclear power capacity estimates



Data source: International Atomic Energy Agency

Current trend is a renaissance of nuclear energy.

On the other hand, it is the new renewable sources which will grow at the fastest pace. Global investments in sustainable energy surpassed all earlier records in 2007 - the total investment was as high as USD 148.4 billion, more than 60% higher than in 2006 (source: International Energy Agency).

1.4 National energy policies and a programmed management of the energy sector

Energy policies

To meet economic development needs and address risks to climate change and energy security it is a fundamental strategic priority of every national economy to determine a set of measures towards an effective utilisation of available energy resources, taking into account the envisaged developments in the areas of energy consumption and energy prices in the world markets. Medium- and long-term policies will be reflected in countries' legislative framework and regulatory measures and policy instruments to stimulate energy savings and to introduce new technologies.

A characteristic feature common to most national energy policies is the endeavour to attain the maximum possible degree of self-sufficiency in the generation of energies while raising the share of low-emission, environment-friendly technologies. These efforts are based primarily on a targeted reduction of noxious emissions discharged as pollutants into the atmosphere. Reduced emissions of sulphur, heavy metals, and dust particles are obtained by higher-intensity cleaning of flue gases prior to discharging them into the atmosphere. In the case of carbon it is expedient to use a combination of two emissions abatement methods: firstly to reduce CO_2 emissions from coal-fired power stations by incorporating Carbon Capture and Storage (CCS) technology prior to combustion or by stripping the flue gases of carbon. This is a very costly method that significantly increases the price of the energy produced, and secondly to boost the support accorded to the production of energy from renewable resources. In countries with access to generation of electric power by nuclear technologies, extending the service life and raising the output power of existing nuclear power stations have been taken into consideration.

The choice of energy policy implementation strategy depends on the specific conditions encountered within the given national economy and is influenced by its structure, economic potential, international commitments and, the prevailing geopolitical conditions. Implementation of national energy policies may also be influenced by financial flows and, simultaneously, spread the entrepreneurial risks so that they are borne by all the investors involved.

Many energy policies involve the use of subsidised prices of electricity delivered to transmission grid from RERs.

Programming instruments

In the long-term, the support lent to the energy sector by governments is orientated upon reducing energy production prices through e.g. financing specific technologies and processes that have the least environmental impact.

While in less developed economies state support is mainly directed into regulating the market with a view to maintaining or reducing the prices which the end users have to pay, in the advanced economies the subsidies are mainly channelled in the form of direct payments to the support of research, development and innovations in the area of cost-effective low-emission technologies. According to data published by the International Energy Agency (IEA), the most significant share of the overall support during the 1974-2006 period worldwide was directed to efforts at introducing new, low-emission processes for the combustion of fossil fuels, as well as to higher-efficiency

technologies (appliances) with low electric energy consumption and, in the OECD countries, above all to expanding the nuclear power sub-sector (Source: IEA database R&D expenditure).

The World Energy Outlook (WEO) published on an annual basis by the IEA Steering Committee envisages, both according to the reference scenario (assuming future developments not entailing any substantial changes of the countries' energy policies) and according to the alternative scenario (this alternative assuming more profound changes to take place in the countries' energy policies), that the world energy consumption would rise about 50% by the year 2030 (year-on-year growth of 1.6%). As at that date, the fossil fuels will take up a share of no less than 81 % of the overall consumption of resources. In view of the increasing prices of fossil fuels (particularly, crude oil and natural gas) and of the dependency of the developing countries as well as the OECD member countries on imports (a dependence of over 60% by 2030) it will be necessary to cope with the threat of interruptions of supplies and the associated price shocks. The WEO 2006 reference scenario asserts that national energy policies to reduce dependency on fossil fuels will require extensive investments, requiring funding to the tune of USD 20 billion (10^{12}) during the 2005 to 2030 period. About 56% will go towards the generation of electric power.

The alternative scenario suggests new approaches and measures mainly incorporating investments to modern, energy-saving electric appliances, equipment and installations or directed toward energy-saving measures to be applied in buildings. As regards the electricity generating capacities and the energy requirements of transportation systems, it envisages a greater development of nuclear technologies and an increased share of bio-fuels, respectively. The total sum of the funding required would be about 20% lower than in the case of the reference scenario, but the success of the scenario would hinge on achieving a very close cooperation worldwide in its implementation (particularly, cooperation by those states that are prime polluters).

Governmental interventions are likely to be directed especially upon boosting energy efficiency both in production and in consumption of energy, upon achieving a more significant increase in the share of non-fossil fuels and upon maintaining gas and crude oil consumption at their present-day levels. (Source: WEO 2006-2008)

To this end, the governments can utilise the following instruments:

A Direct financial support (transfer) – includes the provision of grants to producers under targeted government programmes: grants to consumers as an incentive to save energy (such as in insulating residential buildings to conserve heat, as well as of buildings constituting part of civic infrastructure or when introducing alternative heating sources), low-interest or interest-free loans from the state budget or from state funds, and so on. Examples can be investment subsidies

toward installing technologies that generate electric power from renewable energy resources; capital grants for demonstration projects of energy-saving types of housing; grants in support of expanding research, development and innovations; and grants for educational programmes. A specific kind of direct support is the investment incentives representing *e.g.*, financial support toward creating new jobs or (re)training employees, transfers of land plots, or sales of plots equipped with engineering infrastructures at discount prices, etc.

B Indirect support (preferential tax treatment) – includes discounts on or waivers of mandatory sanction charges and taxes set out by law (tax on turnover, tax on production); regulation of tariffs; credits toward taxes on investment with deductions of all components of investment costs from tax liability; accelerated depreciation of accruals in assets and stocks; tax on investment; exemptions from customs charges and income taxes; energy tax; reductions of taxes on goods or services and excise duties (exemption for bio-fuels); limitations on property and income taxes (free-of-charge leases of public land for wind farms, interconnections of distribution networks paid by consumers, etc.).

C Trade restrictions – characterised by setting criteria for goods such as technical limitations (such as certification of products). This can result in restrictions on products which can be imported; quotas; or setting up customs barriers.

D Energy-related services provided directly by government – represented by direct investments in the energy infrastructure, in the government estate or via state-owned business companies; funding of public research and development; backing commercial loans by state guarantees.

Allocation of government procurements – expressing the government's support to demonstration type, low energy projects for public buildings; the use of hydrogen fuel cells and solar technologies in public services; technical and technological measures conducive to energy savings in public buildings etc.

E Regulation of the energy sector (price controls and market-access restrictions)

- Price regulation by means of subsidised prices, in addition to price control measures.

- Regulatory measures can take the forms *e.g.*, of imposing constraints on the availability of polluting technologies; reducing the transaction costs; addressing obstacles arising along the supply chain; stimulating competition; taking steps to make the technological

innovations markets less uncertain; strategic coordination of key energy commodities markets, etc.

- Emissions trading is a specific form of regulatory measure which has been introduced under the Kyoto protocol and within the EU as a means of reducing emissions, particularly within the power sector.

- Feed-in tariffs provide guaranteed tariffs for energy supplied to the grid to stimulate the generation of electricity from renewable energy sources,. The feed-in tariffs are set above the market price so as to cover the cost of the renewable energy resources, and are modified depending on the form in which the renewable energy resources are generated.

- Supplier obligations can also be designed to promote renewable energy and constitute an alternative to feed-in tariffs. They may impose requirements on energy suppliers, for example, to source an increasing percentage of the electricity they sell from renewable sources, and can involve the creation of trading markets in green certificates (see below). As with feed-in tariffs, the costs of meeting supplier obligations are born by consumers, not government.

- Net metering or the so-called ”net billing” is an important regulatory measure, which allows those consumers who cover a part of their own consumption by operating a renewable source of electrical energy to deliver (sell off) their instantaneous surplus energy to the distribution network.

- Green certificates – are represented by tradable certificates for energy generated from renewable sources. The chief prerequisites for purchasing green energy include well-functioning green pricing programmes, competitive retail sales made possible by energy sector liberalisation (green marketing) and voluntary trading in renewable energy certificates. Also tradable can be the white certificates awarded if a certain reduction of energy consumption has been attained.

1.5 Economic, social and environmental impacts of energy policies

Like other policy areas, instruments to deliver energy policies can have a wide range of intended and unintended economic, social and environmental impacts.

Direct financial support can overcome economic barriers and support innovation. Public funding can stimulate the economy but, by adding to public spending and the state's burden of debt, may increase macroeconomic costs. The cost-effectiveness of public funding needs to be considered against alternative use of the funding. The potentially beneficial additional impacts from supporting renewable energy, such as job generation and the additional social benefits to consumers from support to introduce sustainable energy measures directly in their homes, such as more efficient boilers or better insulation, need to be considered. The level of funding needs to be judged in comparison with the costs involved and the level needed to achieve the intended outcome, and consideration needs to be given to whether it has crowded out more efficient private investment or added to private profits.

Direct financial support that results in energy prices being below what they would otherwise have been may encourage an increase in the consumption of energy. Differences in the prices of energy between neighbouring countries can also distort production and consumption patterns.

Taxes or trading schemes uniformly applied can create incentives to reduce the taxable good. For example, taxes on emissions encourage investment to reduce them. Carbon emissions trading can create a market in carbon and contribute to efficient decisions across industry on least cost abatement. If taxes fall differentially on different businesses they can, however, impact on competitiveness. Exemptions can correct anomalies but may cause other variations and unintended consequences due to the way they are designed.

Taxes increase costs to consumers. This may encourage investment in energy-saving equipment and installations. However energy costs can be a disproportionate cost to low-income households and so rising prices can increase the numbers of "fuel poor" households who cannot afford to warm their homes and may make a disproportionate call on other public social or health services. Fuel poor households may also not have the funds to invest in energy saving devices.

Price support, for example through feed-in tariffs or through supplier obligations, increases costs to consumers in the same way as taxes. However, there is no direct financial engagement by the

national treasury. As with direct support, it is important to consider the rates set and whether it has achieved the intended impact or distorted incentives in unintended ways.

Revenues deriving from taxes and charges, however, add to public funds and can be used to bolster public financing of other measures. .

Regulation can stimulate innovation by reducing the uncertainty faced by innovators, stimulating the process of introducing new technologies by reducing the over-all costs, lowering the trading risks of business undertakings and cutting down the technological costs (thus unburdening the economic system), and influencing more effective market outputs (buildings, transport and energy).

But where regulation determines product or service specifications, it may also increase prices and inhibit the take-up of beneficial, but lower specification, products and services. It may therefore, like taxes, reduce the living standards of low-income households by imposing a higher cost on the consumer.

Policy instruments of any sort, whether direct support, taxes, or regulations may involve considerable accounting and transactional costs, on the industry or on the state budget. Aspects of policy design can minimise compliance costs and bureaucratic costs.

In theory support offered at a level which reflects the costs of environmental costs and externalities will produce an efficient outcome. However, in practice it is very difficult to determine the value of environmental costs and benefits to current and future generations. In practice support levels may need to be determined with reference to evidence on its take-up, as there will be non-economic barriers to investment which the support will also have to overcome, such as the cost of capital, the cost of risk and the cost to applicants of engaging with the scheme. Governments may be able to address some of the barriers directly, for example by changing planning laws or extending the period of the commitment to provide support to reduce the risk to investors.

Chapter 2

The main purpose of Chapter 2 is to provide the SAIs with an overview of the problem areas potentially encountered when planning the audit. When setting the framework of an audit focused exclusively on sustainable energy issues, the areas of energy savings and of enhancing the effectiveness of energy production and utilization should be considered. This will enable a comprehensive assessment of not just the measures taken in respect of energy generation but also of those adopted in respect of regulating the energy consumption.

Effective use of generated energy hand in hand with the renewable energy resources are considered as two main pillars of sustainable energy. At the same time, it is indispensable that the development in these two areas should proceed in parallel with each other.

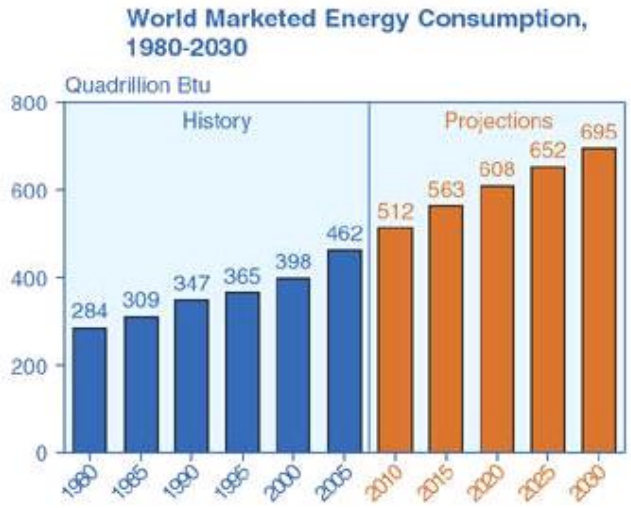
An effective use of energy provides the basis from which any efforts at throttling the growth of energy consumption can be launched, while the growing use of „clean“ energy can mitigate the dependency on non-renewable energy sources.

2.1 Energy consumption

Due to worldwide economic development the consumption of energy keeps increasing at a considerable pace. Based on International Energy Agency's (IEA)[2] data the consumption of energy is expected to experience an average growth rate of 2 % annually (according to 2007 estimates), with a major part of consumed energy deriving from fossil fuels, imposing a huge burden on the environment (*cf*. Chapter 1).

Graph xxx: World Energy Consumption

[2] www.iea.org



Source: History and projections: Energy International Administration (EIA)

In principle, there are three forms in which energy is used:

- in the form of electric energy;
- in the form of thermal energy (for heating purposes, plus the heat required mainly for industrial processes), and also for cooling;
- by the combustion of fuels in transport.

A sizeable share of energy consumption worldwide is taken up by industry, which consumes 30 % to 40 % of all energy. Half of this energy serves to drive production machinery, about one fourth is absorbed by in-house as well as general transportation, and 2% goes to heating and hot water, lighting, and the operation of office equipment. More than 20 % of energy escapes due to various process and heat losses, such as warm water going down the drains without any further use of its heat. Losses also include the consequences of inefficient production processes, excessive energy intensiveness of treating raw materials, useless reshuffling of goods, etc.[3]

Nearly one third of all energy is consumed in urban and intercity transport; here the specific energy consumption per person and unit distance is several times less in the cases of railroad or bus travel than in the case of travel by passenger car.

A substantial share (ca. 25 %) of consumed energy is taken up by housing. The greatest amounts of energy in households are consumed for heating and cooling, as well as for producing warm water and for operating household appliances, including cooking. The data on the share of

[3] Source: www.wikipedia.org

households in total consumption differ country by country. For example, if we compare the USA with European countries, the USA has higher energy consumption; the reasons usually given include the greater popularity of air conditioned apartments and the use of a greater number of various household appliances in the US.

The role of a SAI in audits focused on energy consumption issues

In particular, it has to be considered whether

- the energy consumption issues constitute a part of an adopted energy outline concept, policy or program (if adopted), including biofuels;
- the relevant document sets out requirements that would call for specific ways and means of reducing energy consumption. For instance, implementing more advanced, less energy intensive technologies, investing in research and development of such technologies, etc.;
- it has been laid down in what ways and to what extent the pre-set requirements relating to energy consumption will be implemented and kept within defined bounds;
- these requirements have been complied with by the commercial undertakings acting as energy consumers;
- any transportation strategies are being set up and implemented – *i.e*., whether the various steps taken are interlinked in a logical chain;
- the production and use of biofuels in transportation (both private and public) are supported.

With a view to the mandate entrusted to the SAI, the type of audit chosen may also incorporate an audit of legality, compliance, and performance in respect of selected audit criteria.

The main factors influencing the consumption of energy include the issues of savings and of energy efficiency.

While the principle of generating savings lies in the search for and utilization of technologies and procedures such that would reduce to an indispensable minimum the amount of energy consumed, that of raising the energy efficiency is understood to consist in a maximum usage of the energy generated from primary sources.

Selected factors influencing the energy consumption

In addition to savings and to raising the energy efficiency, it is assumed that the energy consumption trends are and will continue to be influenced by:

- the higher living standard as expressed by a greater incidence and variety of new and better performing household appliances, which in the final outcome may produce energy consumption levels higher than before;
- the higher industrial activity that relates to the foregoing item, inasmuch as the industrial equipment required must first be produced at the expense of high amounts of energy;
- raising the safety standards in their various aspects (such as higher weight; more resistant materials; standby power supply sources for computer technology; duplicated lines and circuitry; highways provided with illumination; warning lights at railroad crossings, etc.), adding to consumption and also requiring more energy to be consumed to manufacture such equipment;
- expansion of ICT (such as digital devices in information, communication, and financial services);
- an upswing of the transportation sector – development of environmentally friendly mass transport, mainly on railroads (electrification of new line sections), expansion of subway systems and of tramway networks;
- environment-focused projects – remediation of old environmental burdens; modernization of operations no longer commensurate with environmental considerations; moving trucks from road to rail; construction of road and motorway bypasses; driving tunnels – all these representing rather energy-intensive activities;
- elevation of hygienic and health standards – due to the dramatically increasing severity of food and health standards the consumption of electrical energy (as well as of other types of energy) is being restructured, with more accent on cooling and freezing, and in the health sector on sterilization and air conditioning.

2.2 Energy savings

Energy savings are understood to represent the amounts of energy saved by adopting specific measure(s), as determined by comparing to a prior measurement or estimate of consumption with a subsequent measurement or estimate taken after the efficiency-raising measure(s) have been implemented.

Energy savings can be in principle broken down into the following areas:

1. The area of energy transformations – overhauls of power plants and heat generating plants nearing the end of their service life, with the consequence of raising the electric energy generating efficiency by:

- increased cogeneration of electricity and heat;
- raising the electric power and central heat generation efficiency;
- cutting down the energy losses in transmission and distribution.

Note: However, further expansion of power and heat cogeneration requires high investments and thus poses great demands on adequate funding. As a rule the generation capacities of existing power plants and heat generating plants involve outdated technologies no longer capable of meeting present-day requirements which usually are determined by legislation. This of course presumes that the generation capacities will be completely replaced or that brand new capacities will be built – a process both time-consuming and very costly.

2. The end-consumer areas – here the focus of potential savings can be perceived primarily in:

- the processing industries, *i.a.*:
  - adoption and implementation of measures identified by energy audits and, in particular, the adoption and implementation of measures resulting therefrom:
  - the use of modern, energy-saving technologies and procedures.

- in households, *i.a.*:
  - heat insulation of buildings, mitigation of heat losses of buildings;
  - support to low-energy and passive housing;
  - energy-efficient appliances;

,

For instance: A method has been developed in all EU Member States that makes it possible to quantify, in a synoptic manner, the energy consumptions of both appliances and buildings.

  - reducing the energy consumption by adopting a more economical standby mode;

For instance: It is expected that, in the EU Member States until 2020, electric power consumption rates of appliances will be reduced to as low as one fourth of their

original consumption rates due to adopting more economical standby modes. Due to throttling down the consumption of these appliances while operated in the standby mode, a potential saving of electric power totalling up to 35 TWh/year across the EU territory is envisaged.

- suitable placing of electrical appliances;
- optimum temperature for economical heating;
- regulation of indoor temperature;
- removing obstacles that hinder free circulation of heat;
- preventing leakage of heat via windows and doors;

For instance: Properly sealed windows can save 10 to 15 % of operating costs.

- energy-saving measures applied to the use of warm and cold water;
- adopting suitable food preparation technologies;
- using economical fluorescent lamps instead of incandescent light bulbs;

For instance: An economical compact fluorescent lamp has a service life three times to fifteen times longer and will consume up to 80 per cent less energy than the classical incandescent lamp. The price differential will be offset as soon as within half a year of operation.

- in transportation, *i.a.*
  - support of public transport;
  - modernization of the fleet of vehicles;
  - the use of so-called „green switch“ for outdoor lighting.

For instance: The use of last-generation compact halogenide discharge tubes which are more efficient energy savers than the sodium discharge tubes. Substantial savings were achieved, for instance, in England and Germany. Thanks to this principle, very high savings can be obtained (up to EUR 2,000 per kilometre of lighted roadway, with an eight-year payback on investment in installing white light illumination).

3. Further potential instruments to achieve energy savings, such as:

- introducing an environmental tax reform;

> *Tax relief measures for energy-efficient installations and equipment making use of renewables – the taxation rate exerts a significant impact on the price of electricity which is different in each state. Also, environmental taxation, increasing the prices of environmentally-unfriendly forms of energy, is imposed on which has a certain impact on energy conservation. Governments introduce price regulation and environmental taxation to constrain the consumption of raw materials or goods that expose the environment to added burdens. Environmental taxation forces citizens and businesses alike to handle the natural resources as effectively as possible and to probe for savings in all elements of the production and distribution chain.*

- green bonuses;

> *Sums increasing the market prices of electricity; these are reimbursed by the regional distribution system or the transmission system operator to those generators who produce electricity from renewables, in consideration of the reduction of damage to the environment by using a renewable source of energy instead of combustion of fossil fuels, or in consideration of the type and size of generating equipment and, thus, the quality of the electricity generated.*

- guarantees extended in respect of payback on investment;

- monitoring and targeting;

> *An effective method of managing energy consumption. It represents a combination of monitoring (following up the consumption of energy) and targeting as an analysis of the results achieved from the point of view of the pre-set energy consumption target. This method is based on a systematic monitoring of the actual energy consumption, an analysis of the results obtained, and a subsequent implementation of remedial measures. Energy savings are achieved based on low-cost measures. This method can be introduced at a relatively low level of investment which routinely pays back within 12 months.*

- information and awareness-raising campaigns;

- educational activities focused on school establishments;

- technologically more exacting methods of production which at the same time are more friendly toward the environment;

- achieving a high degree of environmental awareness of the population.

> *Ranking among the ways of cutting down energy consumption are new technologies capable of bringing in energy savings. In advanced countries, society invests in research and development since customers often realize that the low energy consumption is more important to them than the price itself. At the same time, the environmental awareness of citizens is growing.*

The role of a SAI in audits of programs relating to energy savings

In particular, it has to be considered whether

- the energy saving issues constitute a part of an adopted energy outline concept, policy or program (if adopted), including biofuels;
- the relevant document sets out any requirements that would call for specific ways and means of achieving energy savings. For instance, implementing more advanced, less energy intensive technologies, investing in research and development of such technologies, etc.;
- it has been laid down in what ways and to what extent the pre-set requirements relating to energy savings will be implemented and kept within defined bounds;
- these energy saving requirements have been complied with by the commercial undertakings acting as energy consumers;
- the generators have become involved in the process of development of new technologies and less energy-intensive equipment;
- households and/or energy distributors have been motivated and become involved in energy savings.

With a view to the mandate entrusted to the SAI, the type of audit chosen may also incorporate an audit of legality, compliance, and performance in respect of selected audit criteria.

2.3 Energy efficiency

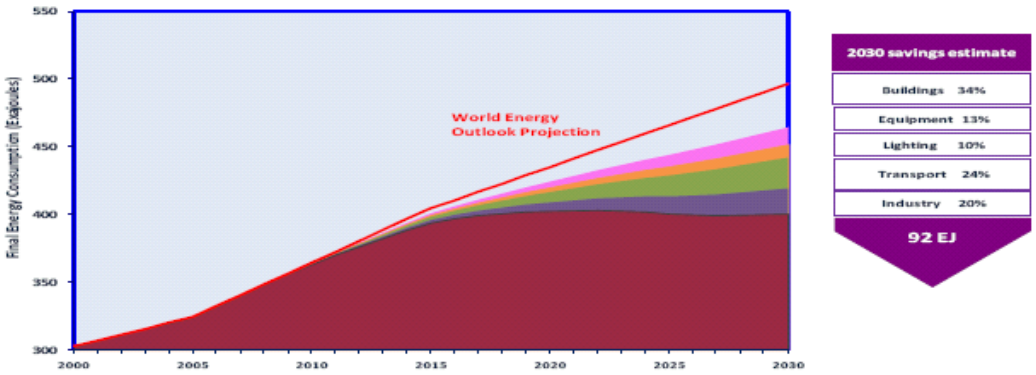
Effective use of energy incorporates a maximum utilization of energy deriving from the primary energy sources at all stages of the energy cycle.

Different countries differ a lot in terms of their over-all energy efficiency achieved. The highest efficiencies have been noted in the OECD countries. At the same time it can be stated that in recent years, the level of energy efficiency has moderately improved in most countries.

Safe clean energy ranked among the chief key topics of the G8 summit held at Gleneagles in June, 2005. Based on this, the International Energy Agency (IEA) was called upon to undertake the requisite analyses of energy utilization and of efficiency improvements in buildings, transportation, and industry; these analyses resulted in a list of recommendations relating to these issues, aiming at a reduction of CO_2 emissions of 8.2 Gt/year by 2030[4].

The greatest savings are expected to be achieved in the area of new construction of buildings as well as in the area of existing buildings where up to 40 % of all energy is consumed in most countries, and also in the industrial sector. The impact upon the world energy consumption of these IEA measures adopted during the 2006 – 2008 period is demonstrated by the Graph. no.

IEA Energy Efficiency Policy Recommendations, 2006-2008.
Impact on World Final Energy Consumption



Annual savings of 8.2 Gigatonnes of CO_2 per year in 2030

[4] http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=2047

Source: IEA Analysis

Pursuant to an IEA report dating from 2008, no country so far has implemented all its recommendations in full. A number of projects are yet to be completed in all G5, G8, and IEA countries to achieved full implementation.

The role of a SAI in audits of programs concerned with energy efficiency

In particular, it has to be considered whether

- the energy efficiency issues constitute a part of an adopted energy outline concept, policy or program (if adopted), including biofuels;
- it has been laid down in what ways and to what extent the pre-set requirements relating to effective utilization of energy will be implemented and kept within defined bounds;
- the increase in energy efficiency has been achieved at the end consumer facility thanks to technological or economic changes or as a consequence of human behaviour.

With a view to the mandate entrusted to the SAI, the type of audit chosen may also incorporate an audit of legality, compliance, and performance in respect of selected audit criteria.

2.4 Instruments used to regulate energy management

Energy efficiency ranks among the key concepts of the energy policies presently pursued by a number of countries. The energy, environmental, economic, and social aspects ought to be considered by all of them when setting the priorities and objectives and choosing the instruments toward a higher energy efficiency. A more efficient use of energy can support economic growth while consuming less energy, also giving rise to a positive side effect – mitigation of the negative environmental impacts of the use of energy.

The instruments assisting greater energy efficiency have to be focused on ensuring an economical and effective energy generation, on a more efficient energy transmission and distribution, and on an effective utilization of the energy being consumed. This will contribute to the required minimization of raw material inputs and to the maximum abatement of emissions produced in the energy generation process.

2.4.1 State programs

The priorities and objectives of the national energy policies or outline concepts are implemented by means of diverse tools which are of a rather variegated nature as to their orientation and effect. In addition to legislative instruments creating the basic conditions for regulation of the energy sector, it is especially the state support programs which serve the implementation of the long-term objectives, focused as they are upon enhancing the effectiveness of energy management without imposing any additional environmental burdens on the one hand and upon cutting down the energy consumption on the other hand. These programs are conceived based on the needs arising from long-term outlooks and analyses, and represent financial support instruments whereby specific areas of the energy sector can either be supported or not.

The above programs fall within two categories:

Energy-economic programs encompassing supported areas such as those listed below:

- measures to rationalize the ways in which energy is treated and handled;
- cogeneration of electric power and heat;
- emissions abatement measures at the pollution sources;
- power and heat generation from secondary and renewable resources;
- raising the share of alternative fuels in the transportation sector;
- measures to reduce heat consumption in office buildings as well as in housing;
- research, development, and innovation.

Hand in hand with the aforementioned programs designed to assist the restructuring of the energy sector go the environmental-social programs. Their objective is to mitigate the social impacts on concrete regions resulting from downsizing of coal mining operations, and to deal with the social consequences of employment losses in the energy sector.

The role of a SAI in auditing the programs

From the level of the executive bodies objectives of the programs are implemented by means of a broad range of financial instruments with direct links to the state budget. These may include, for instance, direct subsidies disbursed in compensation of a part of the project costs, subsidized

interest on commercial loans, or state guarantees for bank loans drawing upon commercial banking institutions. An important instrument can be the provision of advantageous (interest-free) loans from funds established by the state for funding of environmental improvement measures (for instance, to reduce the energy intensiveness of technologies or buildings). Specific forms of indirect financing can include government participations in PPP (Public Private Partnership) projects or a deferred repayment facility for penalty charges assessed to industrial companies for atmospheric pollution due to combustion of fossil fuels in those cases where the operator of the emission source has demonstrably launched an investment project to install new, more energy-efficient, and above all, low-emission technologies.

The role of a SAI may consist in auditing the following material aspects of the programs:

- specification of the program objectives and their compliance with the strategic objectives of the state energy policy, together with the objectives defined for sustainable development by the state environmental policy (assessment of impacts *e.g*. on ecosystems, human health, etc.);
- quantifying the needs, and the ways of satisfying such needs, from available government sources, with participation of resources of the private sector funding (financing, capacity, time allocation, …);
- setting up steering documents for the programs encompassing adequate project selection criteria and the conditions of their transparent evaluation from the aspects of the programs' projected benefits;
- quantitative and qualitative characteristics of the programming priorities defined by means of monitoring indicators for the programs that lend themselves to measurement and evaluation;
- setting up efficient internal control and audit systems by the administrators of the programs;
- various levels of monitoring, progress evaluations, and reporting.

In respect of specific projects funded within the framework of the support programs, SAIs depending on their mandate can engage in audits of some of the following issues:

- administration of project assistance applications;
- ascertaining whether an energy audit has been completed for the project and whether the assessment of its energy aspects has been in compliance with valid legislation;
- assessing the compliance of project documentation with the requirements of national legislation, such as undertaking an EIA (SEA), for instance;
- determining the share of co-financing from public sources in linkage to environmental benefits, such as for the purpose of:

    - minimizing the generation of non-degradable and non-recyclable wastes in energy generation;
    - safe storage of dangerous wastes produced in energy generation;
    - abatement of gaseous and solid emissions causing atmospheric pollution;
    - boosting the capacities for energy generation from renewables;
- whether a public tender has been called based on documentation adhering to the principles of transparency and non-discrimination;
- how the implementation of the project was secured by appropriate contracting and how the price was set;
- security of the principal in case of a state guarantee being extended;
- revision of the project implementation costs and of adherence to the pre-set terms of financing;
- the rationale for any material changes and supplements to the project, deadlines for completion;
- the project completion and commissioning dates, its final evaluation including a verification of whether the projected parameters have been reached;
- cost utility/cost benefit analyses (in respect of the environmental and financial benefits of the projects).

With a view to the mandate entrusted to the SAI, the type of audit chosen may also incorporate an audit of legality, compliance, and performance in respect of selected audit criteria.

2.4.2 Investment incentives

Investment incentives constitute one of the forms of public support that can be oriented on energy savings, renewable energy resources, power and heat cogeneration, as well as higher utilization of domestic sources of primary energy. In the case of investment incentives the executive bodies determine the admissible degree of public support based on the project investment costs as submitted by the applicant asking for investment incentive type support. A specific support with an indirect impact on enhancing the efficiency of the applicants' energy management can have the form of a relief on the income tax over a definite period of time dependent on the character of modernization of the existing production capacities.

The role of a SAI in audits focused on investment incentives

In particular, it has to be considered whether

- the procedure adopted by the executive bodies is in compliance with national legislation and with accepted international commitments (amount of support, transparency of selection, …);
- the application for support as submitted by the applicant has complied with the terms and conditions set out by the executive bodies for the implementation of the project under scrutiny;
- any material changes to the project and project supplements were justified and whether the pre-set deadlines and other terms and conditions were adhered to;
- the end-of-project parameters attained by the investment are commensurate with the planned parameters (including *e.g*. its impact on territory, landscape, and population).

With a view to the mandate entrusted to the SAI, the type of audit chosen may also incorporate an audit of legality, compliance, and performance in respect of selected audit criteria.

2.4.3 Support of research, development, and innovation

This is an area which tends to be dealt with in comprehensive fashion by adopting programs focused primarily on an effective use of energy resources, on renewable energy resources, and on power and heat cogeneration (for instance, the EU Member States make use of the opportunity provided under the 6th Action Programme in the domain of energy and the Decision no. 1230/2003/EC of the European Parliament and the Council adopting a multiannual program for action in the field of energy: „Intelligent Energy – Europe“). As to substance, they not only encompass the research and development of new, low-energy production technologies, electrical appliances, propulsion units and assemblies for transport vehicles, and new construction methods for building structures to minimize heat losses of buildings, but also the dissemination of know-how and exchange of experience through consultancy agencies, education and training, awareness raising activities promoting so called best available techniques (BAT), etc.

The role of a SAI in audits of research, development, and innovations

The following items have to be given particular consideration:

- specification of the program targets and their compliance with the strategic objectives of the state energy policy;

- compliance of the support provided to research and development projects with pertinent national legislations;
- support extended to research centres, information infrastructure, and international cooperation programs;
- program support and its linkage to pre-set target evaluation indicators; transparency of project selection;
- in specific projects, the linkage between project targets and program priorities, monitoring and evaluation of benefits, and adherence to the terms and conditions under which state support was granted;
- specific criteria so chosen as to serve an assessment of the energy and environment related indicators, such as:
    - whether the issues of waste-free technologies and of minimizing emissions were properly considered for the projects under scrutiny;
    - whether the energy efficiency or energy intensiveness were evaluated;
    - the extent of using renewable energy resources.

With a view to the mandate entrusted to the SAI, the type of audit chosen may also incorporate an audit of legality, compliance, and performance in respect of selected audit criteria.

2.4.4 Environmental aspects of the tax system

The ecological reform of the tax system represents a shift from the taxation of labour towards the taxation of goods and services whose production and consumption exerts negative impacts on environment and on human health. An environmentally friendly tax reform should possess the fundamental attribute of being generally revenue-neutral and should not impose tax burdens beyond the over-all level of taxation. In its material aspects, it is concerned, for example, with amending the motor vehicle tax and, in particular, with increasing the excise tax imposed on electric power generated from non-renewable resources, using the environmental tax revenues to offer relief on other taxation (such as the income tax) or discounted social and healthcare insurance premiums. For instance, the EU Member States when tackling ecological aspects of the tax system are guided by Directive no. 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity, which declares the principle "not to increase the overall tax burden". On the other hand, the environmentally friendly fuels and methods of electricity generation ought to be practically exempt from taxation.

The role of a SAI in auditing the environmental aspects of the tax system

In particular, it has to be considered whether

- the legislative amendments proposed by the government are consistently and effectively conducive to stimulating the resolution of the problems identified;
- the principles and the time schedule of the environmentally friendly tax reform were observed;
- the proposed legal standard is legislatively linked to the support of renewable energy resources, the support of biofuels, and the legislative standard applicable to the emission trading system.

The type of audit chosen may be executed as an audit of legality, and possibly also of compliance.

2.4.5 Regulation of the prices of energy

Even though the energy market should be the maximum possible, particularly as concerns the electric power and natural gas commodities, it still remains a permanent task of governments in most countries to follow the impacts of prices on the population and to adopt regulations in order to influence the long-term price and tariff relations. Simultaneously, the authorized state agencies should evaluate the effectiveness of regulation and should flexibly adapt the regulatory framework. As soon as the energy market becomes completely open the market rules applicable to different forms of energy must be harmonized.

The role of a SAI in auditing the regulation of energy prices

In particular, it has to be considered whether the government and relevant authorities

- do evaluate the adopted price regulation and do flexibly adapt the regulatory framework so as to correspond with the required market developments of the prices of various forms of energy;
- adopt appropriate measures necessary for harmonizing the legislation required for opening the energy market to international trading;
- have not adopted excessive regulation thereby according priority to the dominant position of the country's own producers while excluding their foreign competitors;

- have standardized the system of disclosing the comprehensive energy-related information and the public discussion thereof.

The type of audit chosen may incorporate an audit of legality, and possibly also of compliance with connection to selected audit criteria.

2.4.6 Other instruments

The trend of development of the energy sector can also be significantly influenced by economic instruments such that do not provoke, at the first glance, any substantial pressure in the direction of a speedy restructuring of this market. For example, **trading in unspent greenhouse gases emissions limits** is one such instrument. For this economic instrument to be implemented by the different signatories of the Kyoto protocol, it is indispensable that the terms and conditions of the emission trading system are given firm bounds by legislation while also defining the methods of determining, reporting, and verifying the overall amounts of the emissions. From the point of view of greenhouse gases emissions abatement, the key element of the system is the so-called national allocation plan which sets out the method by which the emissions permits for a given period of time will be allocated to businesses, together with the amounts to be allocated. Legislative linkage between the trading system and the flexible Kyto mechanisms is also a necessity. A desirable end effect of the trading transactions would be a re-allocation of the revenues from sales of the emissions permits to the area focused on the abatement of these greenhouse gases emissions. This issue is subject of INTOSAI Climate Change Guide (www…….)

The role of a SAI in audits focused on trading in greenhouse gases emissions

In particular, it has to be considered whether the government and relevant authorities

- have elaborated comprehensive proposals to create legislative prerequisites for greenhouse gases emissions trading;
- have secured support for the use of the flexible mechanisms of the Kyoto protocol, have concluded memoranda of cooperation at an international level, and thus have created the prerequisites for participation in projects of joint implementation of the Kyoto protocol;
- have adopted a national allocation plan;
- have ensured that the revenues from the sales of the emissions permits would be channelled into abatement of greenhouse gases emissions.

The type of audit chosen may incorporate an audit of legality, and possibly also of compliance.

Chapter 3

Audits focused on the area of sustainable energy are issue-specific environmental audits. They incorporate all types of audits[5]. For example, they may be oriented on the reporting of assets and liabilities (financial audit), on compliance with legislation (with national as well as international conventions) as much as on investigations of the economy, effectiveness, and efficiency of activities and programmes (performance audit).

There has not been much experience with audits conducted specifically in the area of sustainable energy; many SAIs have not performed them at all (*cf*. Annex to the Manual no. xx – Outcome of the evaluation of questionnaire survey). This is why we present more general recommendations for conducting audits focused on this area, based on general principles and on the experience of the selected SAIs. These recommendations are not intended as a strict set of instructions; rather, they should provide a certain inspiration for the SAIs which then would adapt them so as to suit the conventions and legislation of their particular countries. Both the preparatory procedure to an audit and the execution procedure of the audits conducted in this area can also draw upon the INTOSAI Auditing Guidelines ISSAI 5130 Sustainable development: The Role of Supreme Audit Institutions.[6]

Conducting audits with a focus on the area of sustainable energy comprises several major phases.

[5] Types of audits – see Glossary

[6] Http://www.issai.org/media(2206,1033)/ISSAI_5130E.pdf

Questions requiring decisions in respect of the different phases

The audit planning phase

Has the need arisen for conducting an audit in the area of sustainable energy?

Has the SAI a mandate to conduct such an audit (*e.g.*, to review government policies)?

Is the SAI planning to conduct an audit in the area of sustainable energy (*e.g.*, focused on subsidies toward strengthening renewable energy resources, energy savings, etc.)?

Is the SAI adequately equipped to conduct such an audit (*i.e.*, in terms of its capacity, time, finance, and technical resources available)?

The audit preparation phase

Decisions regarding the audit goals, questions, and criteria

Has the SAI taken a decision regarding the area upon which the audit is to be focused?

Has the SAI developed a notion of the audit goals and outcomes?

Will be the audit conducted in cooperation with other subjects (SAIs, external experts, etc.)?

Has the SAI decided on the type of audit to be conducted (performance, financial, or legality audit)?

Risk analysis

Will be the SAI able to undertake a comprehensive risk analysis (by its own auditors or employing external experts)?

Has an analysis of all types of risks been undertaken (inherent, control and detection risks)?

Has a risk map been elaborated (*i.e.*, interactions of all potential risks)?

The audit execution phase

Compliance with international treaties and agreements, national legislation, and government policies

Within the framework of the planned audit, will the SAI be involved in examining the compliance with international or national (regional) agreements applicable to the area of sustainable energy?

Does the SAI have available the full national legislation relevant for the planned audit?

Are there any government energy policies (programmes, policy concepts/outlines, policies)?

Performance evaluation criteria

When conducting its audits, does the SAI put to scrutiny the setting of goals/targets of the energy policies/outlines/programmes and the instruments thereof?

Will the SAI review the existence, completeness, plausibility, and credibility of any tentative analyses of the societal and economic effectiveness of implementing the policies and the relevant instruments?

Does the SAI review the system and the interlinking of the management and control of the implementation of the policies in relation to an economical utilization of subsidies/assistance?

Will the SAI put to scrutiny the system of assessing the policy implementation goals?

The audit conclusion phase

Treatment and processing of the audit results – the final report

Reporting

Does the SAI have ways and means available for informing the general public and other stakeholders on the results of the audit?

Does the SAI follow an established procedure in informing the general public and other stakeholders on the results of the audit?

Does the SAI have information on who are the recipients of the results of its audits (government, the public)?

Impact assessment and monitoring

Does the SAI intend to monitor what further developments take place in the area covered by the audit?

Is it the SAI's intention to conduct a follow-up audit focused on this area?

3.1 The audit planning phase

During the course of the first phase of the audit, attention is paid above all to the fact that the need of conducting an audit in the area of sustainable energy has arisen. Such a need can arise as a result of monitoring and evaluating the activities of the state in the area under scrutiny (such as some topic of primary importance), or the audit may be started by an impulse given by some competent body (such as the government, the national parliament, etc.) and by the public. However, it also depends on whether the SAI's auditing strategy has reckoned with audits in the area of sustainable energy.

In the first place, the SAIs have to ascertain whether or not they possess the mandate for conducting this audit. The scope of the audit is set out by pertinent legislation.

Commentary

The questionnaire survey has shown that lacking mandate poses a problem when conducting audits focused on the area of sustainable energy.

For instance, the SAIs of Poland, Slovenia, and Ukraine indicated this fact as representing a constraint (limitation, or barrier) of their auditing activities. Also in the Czech Republic, the SAI is unable to audit the steps taken in the area of sustainable energy by the Czech Republic's largest energy corporation, in spite of the fact that the state itself is that corporation's shareholder. The legislation which spells out the SAI's mandate fails to specify an authorization for the SAI to this effect. In the Czech Republic, the SAI when auditing the said corporation can merely conduct an audit of the funds drawn upon by the energy corporation from the budget of the Czech Republic or from the EU budget.

At this stage, an evaluation is required to find out whether the SAI has been planning, or has indicated preference for, any audits focused on sustainable energy, such as in the areas of renewable resources, energy savings, etc. It transpired from the questionnaire survey, among other things, that some SAIs have not even planned any such audits, due precisely to the absence of pertinent mandate, or as the case may be, due to lacking human or financial resources.

Commentary

The lack of financial resources or suitable personnel has been the main reason why for example, the SAIs of Surinam, Cambodia, or Tanzania have neither conducted nor planned to conduct any audits focused on renewables in the near future.

Further, suitable topics (areas of interest) are identified which might be potentially considered for audits focused on sustainable energy. Gathering of experience is in progress, efforts are made to ascertain whether the region under consideration has already been audited before (or as the case may be, whether it underwent an audit conducted by some other institution; whether any audits with this focus are being conducted in other countries, and with what results), and existing analyses which concentrate on the area under scrutiny are reviewed.

It is also important to decide whether the topic chosen is of sufficient importance and whether the audit's potential costs will not exceed its expected benefits. Another aspect to be weighed is the degree of exactingness of the audit, and whether the SAI will be capable to secure the conditions required for the audit to be conducted to the desired standard of quality.

The SAI will have to resolve the following questions:

- the issue of staffing, *i.e*., whether it has an adequate number of qualified auditors available for conducting an audit focused on the area of sustainable energy, or whether it will employ the services of external professionals (in the latter case however, it would be necessary to have the backing of a relevant budget and to make sure of adopting a transparent selection procedure for picking the independent external experts);[7]
- the availability of necessary and relevant information and of reliable data;
- a suitable timing of the audit;
- any potential risks faced in conducting the audit.

Commentary

The fact that the lack of auditors suitably qualified for conducting audits focused on sustainable energy poses a substantial problem is also confirmed by information gathered from the other SAIs in the questionnaire survey. It has been identified as one of the problems affecting auditing activity by the SAIs of Estonia, the USA, Brazil, Poland, and others.

[7] When dealing with the capacity building issues in relation to the audits to be conducted, Chapter 4 of INTOSAI ISSAI 5130 standard can be used.

3.2 The audit preparation phase

3.2.1 Decisions regarding the audit goals, questions, and criteria

In case that the need has arisen for conducting an audit in the area of sustainable energy, the SAI has the required mandate, and adequate conditions for conducting the audit have been secured, the SAI may continue with the preparations for that audit.

- **Defining the area to be audited**, *i.e.*, the SAI takes a decision regarding the areas of sustainable energy that would be included in the scope of the audit. In many cases, it is not possible to unambiguously single out just one area. Because of existing links, the audit will often cover several areas of sustainable energy at once.

Examples of sustainable energy areas already audited by some SAIs (see also the part of Chapter 3 dedicated to case studies):

- state (national) energy programmes;
- the system of subsidies focused on renewable energy resources;
- elimination of barriers for further expansion of the use of renewables;
- the system of electricity supply;
- activities pursued to increase the energy efficiency;
- government activities to eliminate large energy outages or gaps;
- regulation in the energy sector;
- support of science and research in the area of sustainable energy;
- energy savings.

- **Defining the audit objective and identifying suitable subjects to be audited:** *i.e.*, setting out what should be achieved by conducting the audit and who the auditees would be (the government, the relevant Ministry; government organizations; a state fund; a non-governmental organization; beneficiaries of subsidies, etc.).

An audit focused on renewable energy resources may assess this area from various angles, such as:

- whether the support programmes have been properly designed and prepared;
- whether the programmes are being implemented in an economical, effective, and efficient manner;
- whether the programmes are subject to continuous monitoring and evaluations, and with what results;
- whether the programmes in support of renewable energy resources are functional and sensible; what kind of improvements could be recommended; etc.

Some government programmes may have significant impacts which however may be both positive and negative, with both intended and unintended consequences.

For example, the SAI may evaluate the settings of:

- the programme or its activities;
- the environment in which the programme is run;
- the starting conditions.

- **Defining the audit scope and the methods to be adopted**

  At this stage, when considering the scope and methodology of the audit, it is indispensable that appropriate starting criteria are set, *e.g*., in cases where no legislative requirements apply to the programme under scrutiny. The SAI may compare the implementation of the programme with examples of best managerial practice or with practical procedures adopted in case of similar programmes in the same country or in some other country. It is also possible to compare the results achieved by a given programme during the course of a certain period of time, seen either from the angle of the actual goals of the programme or from the angle of benchmarks set by experts.

  During this phase already, some SAIs conduct *e.g*., a preliminary analysis of the feasibility of the audit, an analysis of potential risks, a SWOT analysis, and/or a problem analysis. Tentative considerations are launched to determine suitable criteria, modes of evaluation, applicable methods, potential data sources, sample selection possibilities, the potential extent of the audit, etc. A feasibility study is produced – unless already elaborated during the foregoing phase; and following its habitual usage (procedures) the SAI will engage in further steps such as conducting a preparatory study (an audit project). Previous experience is sourced, as well as any earlier audits, the experience of other SAIs, etc.

Subsequently, the SAI will have to decide on the form of the audit; whether the audit will be conducted individually or in cooperation with other SAIs (as a coordinated, parallel, or joint audit) or by external professionals; and the type of audit (see Glossary for definitions).

If the SAI decides to carry on with the preparations of an audit focused on sustainable energy, it will carry out the following:

- determine the programme of the audit and the audit schedule; formulate the audit questions; set suitable criteria; and choose suitable methods depending on circumstances;
- identify the number of auditors required for the given audit and the scheduling of the audit steps;
- lay down the detailed auditing sequence and its breakdown for the auditor teams involved;
- have the auditors become acquainted in detail with the issues at hand; have them apply for a legal analysis; request expert opinions on the issues; or request cooperation with external experts.

Case study – The preparatory phase of an audit conducted by the Czech Republic's SAI

Audit entitled „Financial means allotted to support programmes for energy production from sustainable energy resources and for energy savings support“

Audit objectives: Review the spending of funds earmarked for support of the use of renewable energy resources; this includes setting up the conditions conducive to meeting the indicative goal of reaching a share of 8 % of electricity generated from renewables in the total gross consumption of electric power in the Czech Republic by 2010.

The auditees:

- Ministry of Industry and Trade of the Czech Republic;
- Ministry of the Environment of the Czech Republic;
- State Environmental Fund of the Czech Republic;
- CzechInvest, the Investment and Business Development Agency;
- selected beneficiaries of financial assistance.

Audit period: the years 2005 through 2008; in case of substantial associations, also the foregoing years.

Scope of audit: The basic aspect considered was the evaluation of how the indicative targets of energy savings and the use of renewables were reached, regardless of where the state funds used to implement the objectives were coming from. When assessing the degree of meeting the indicative targets of electricity generation from renewables, both the measures adopted to raise the share of electricity from renewables and the measures taken to cut down the over-all electricity consumption were considered. Also, the degree of adherence to the principles of economical and expedient spending on energy-saving and renewables-boosting measures was reviewed.

Scope of audit for the different auditees:
Ministry of Industry and Trade of the Czech Republic – policy-level as well as programming activities oriented toward setting and actually attaining the objectives; managerial and auditing procedures concerned with state funds earmarked for the implementation of the State programme in support of energy savings and the use of renewables (hereinafter, „the State programme“) and with the funds of the EU Operational Programmes; administration of the disbursement of support from the State programme.

CzechInvest, the Investment and Business Development Agency – administration of the disbursement of support funds from the EU Operational Programmes for projects focused on energy savings and on renewables, monitoring of the degree of attainment of the pre-set parameters and preparation of background data for evaluation of the programmes.

Ministry of the Environment – policy-level and programming activities concerned with setting and attaining the objectives; managerial and auditing procedures concerned with state funds set aside for the implementation of the State programme and with the funds of the EU Operational Programmes in support of energy savings and the use of renewables.

State Environmental Fund – administration of the disbursement of support from the State programme and from the EU Operational Programmes for projects focused on energy savings and the use of renewables.

Recipients of subsidies – auditing the spending of support funds from the various sources; evaluations of the benefits deriving from the implementation of the project from the point of view of meeting the pre-set targets. Due consideration was also given to providing coverage of the greatest possible range of supported projects – wind power stations, small hydroelectric plants, photovoltaic systems, biogas, biomass.

Criteria for assessing the material and formal correctness: Pertinent legislation including the State programme.

Criteria for assessing the expedience and economy of the audited area: Attainment of the target parameters is the essential criterion.

Audit type: In mutual combinations, reviewing the legality, material and formal correctness, and the elements of the performance audit where the aspects of efficiency, effectiveness, and economy are put to scrutiny.

3.2.2 Risk analysis

A risk is understood as the probability of an event or activity causing a failure of implementing a policy or a programme in an economical, effective, and expedient fashion.
At the outset of the audit, it is advisable to undertake a risk analysis with respect to the specifics of the given country, so as to make it clear which area of auditing activity will be the most rewarding. The risk analysis can be performed by the SAI's staff or by independent external professionals. Having identified the selected audit topics and priorities it is necessary to define and analyze the internal and external risks which jeopardize the attainment of the objectives and to outline the principles and concrete procedures which will serve to properly manage the risks identified.
It is necessary therefore, prior to the data gathering exercise, to undertake an over-all assessment of the internal audit system of the auditees including their ITs, aiming to identify those risks which might affect data integrity.

For the auditors, the information obtained represents the launching pad for analyzing the most essential risks. It is important for the risk analysis to cover all types of audit risks. The major audit risks include:

- inherent risk (the risk of a substantial incorrectness occurring);
- control risk (the risk of the inspection system of the accounting entity failing to prevent or rectify such incorrectness);

- detection risk (the risk of a substantial incorrectness failing to be identified by the auditor).

The major risks identified may become subject of further, more detailed examinations using the so-called map of risks. The map of risks is a document which, making use of graphic representation or

of tabular listings of the risk factors identified provides information on the degree of significance of the risks from the standpoint of their undesirable impacts upon the proper administration and management of programmes and projects. The significance of the various risks, the probability of their occurrence, and their impacts are determined by the auditor based on obtaining an understanding of the audit environment[8].

When analyzing the risks, it is indispensable for the auditor to review the following:

- any difficulties that could potentially be encountered;
- the probability of such difficulties actually occurring;
- their potential impact;
- the strategy potentially adopted by the auditee to minimize and contain the risk.

The risk factors may include, for instance:

- the nature and the degree of complexity of the energy policy or of individual programmes and operations;
- the diversity, incongruity, discontinuity, and fuzziness of objectives;
- non-existence or non-use of appropriate performance indicators;
- an impaired availability of funding sources;
- complex organizational structure of the pertinent responsible agencies or departments and equivocal allotment of responsibilities;
- non-existence and poor quality of auditing systems;
- complicated or poor information.

The SAI audit in this area should determine whether the government has been abiding by its commitments accepted through the treaties and agreements, acts of law, policies, and programmes it adopted, in particular with respect to:

- implementation of the government policy aiming to foster the development of the various forms of renewable energy;
- the anchoring of this government policy in legislation;
- the fulfillment of the government policy in the field of sustainable energy;
- any changes required for the government policy to yield improved results; if so, what changes;
- adoption by the government of acts of law and other legislation to harmonize international commitments and domestic policy;

[8] For an example of a map of risks, consult the Annex to Manual no. xx.

- observance, by the given country, of rules and agreements laid down by international treaties of which the country is a signatory;
- the existence of any discrepancies between the government policy and international treaties and agreements of which the given country is a signatory.

3.3 The audit execution phase

3.3.1 Compliance with international treaties and agreements, national legislation, and government policies

One of the fundamental types of audits is the audit of legality, that is, the audit of compliance with legislation. The scope of the audits may differ for different SAIs depending on their respective legislative/constitutional competencies. Connected with it is also the identification of legal norms containing criteria applicable to the evaluation of the audited activities at the auditees.

The procedure used to determine the criteria for audits focused on sustainable energy is linked with the section concerned with the determination of the subject and objectives of the audit. When determining the subject and objectives of an audit, the pertinent SAI also has to decide on which economic instruments of support to the use of sustainable energy with be included in the scope of the audit. The most frequent type of audits focused on the area of sustainable energy can be the audit of state subsidies channeled directly to the beneficiaries of the support.

Setting the criteria

When preparing an audit in the area of sustainable energy, it is important to become acquainted with the duties of the auditee as defined by or resulting from legislation. In case of sustainable energy audits representing a specific type of environmental audit, a great number of legislative norms and regulations can be tapped. For this reason, the pertinent SAI or as the case may be, the pertinent group of auditors preparing for the audit, should pick those legislative norms which are of essential importance from the point of view of the audit objectives.

It is advisable that national legislative norms mainly covering the following areas are chosen for the audit:

- legislative norms pertaining to the areas of budgeting and managing state funds;
- legislative norms applicable to the area of accounting;
- legislative norms applicable to the area of public procurement;
- legislative norms applicable to the area of support to sustainable energy.

The two principal questions of importance to the determination of criteria for sustainable energy audits are as follows:

- the SAI can make use of international treaties and agreements for setting criteria;
- the country has adopted a generally binding legislative norm (has passed an act of law) governing the issues of support to the area of sustainable energy.

Subsequently, based on the answers to these key questions, the pertinent SAI can take a decision on which criteria it will choose. The reason is that not all states have legislation specially designed to regulate the area of sustainable energy.

For instance In the Czech Republic this area is regulated by Act no. 180/2005 Coll. on the Promotion of the production of electricity from renewable energy sources and on amendments to certain acts, which entered into force on 1. 08. 2005.

Breakdown of the criterial sources:

- International agreements:
  - represent the principal formal source of international law;
  - bilateral or multilateral agreements can be distinguished depending on the number of signatory parties.

- National legislation:
  - from the point of view of legislative competencies of the different SAIs, this will be the principal source of audit criteria;
  - acts of law; implementing legislation/executive regulations pursuant to acts of law; government policies; support programmes; rulings or, as the case may be, agreements on the provision of support/assistance, etc.

It is up to the given SAI whether it will choose both these aforementioned sources for defining its criteria or will only resort to national legislative sources. Observance of commitments arising from international treaties and agreements may become the subject of parallel, coordinated, and joint audits conducted by several SAIs. These problems are treated in more detail in the INTOSAI – ISSAI 5140 standards[9].

The binding character of the international treaties and/or agreements is an important factor when these are being chosen for audit criteria. The range of parties to the treaties or agreements is limited because not all states have signed or ratified any given international treaty/agreement.

International treaties/agreements as a source of criteria applicable in sustainable energy audits[10]

Up to now, no international treaty of global validity has been concluded yet that would directly address the area of support to sustainable energy. Thus, from the point of view of a potential audit, the SAIs may resort to using the criteria defined in international treaties and agreements which indirectly relate to this matter.

The most important international treaties of this kind include:

- the UN Framework Convention on Climate Change;
- the Kyoto protocol to the UN Framework Convention on Climate Change.

Adopting a wider interpretation, the following international treaties can also be taken into account:

- the Convention on Long-Range Transboundary Air Pollution (1979);
- the Protocol to the Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone (1999, Göteborg).

National legislation as a fundamental source of criteria

[9] ISSAI 5140 – How SAIs may co-operate on the audit of international environmental accords (http://www.issai.org/media(789,1033)/ISSAI_5140_E.pdf

[10] Examples of criteria – see Annex to Manual no. XX

In addition to international treaties and agreements, states adopt their own national legislations addressing the support to sustainable energy. As has already been mentioned in Chapter 1, this support may assume different forms. Just as in the case of international treaties and agreements, it is important to know the constitutional/legislative competencies of the pertinent SAIs, because it is solely on their basis that in can be determined whether any given SAI is authorized to conduct an audit of the economic instrument concerned.

The criterial sources may include in particular:

- acts of law;
- implementing provisions/executive regulations pursuant to acts of law;
- government policies;
- support programmes (programme schemes);
- rulings or, as the case may be, agreements on the provision of support/assistance of a specific beneficiary/recipient.

Commentary

Determining the right criteria represents one of the fundamental prerequisites to a successful outcome of the audit. Those SAIs which have already been engaged in conducting audits focused on the area of sustainable energy (source: Questionnaire survey) indicate national legislation as their major source of criteria.

3.3.2 Performance evaluation criteria

A performance audit has the performance requirements or standards as its audit criteria. Based on these requirements or standards it compares and evaluates the adequacy of systems and procedures, as well as the economy, effectiveness, and efficiency of the activities performed. They are determined in order to be able to assess the true activity of the auditee and to formulate a description of the facts ascertained and the deficiencies detected. The performance audit criteria should be unbiased, adequate, attainable, clearly interpreted; the reasons why they were selected as well as their importance should be known. These criteria have to be set in relation to the subject of the audit at hand, and this is why different performance audits may employ different criteria.

The criteria adopted for audits focused on sustainable energy will differ depending on the specific orientation within this area (energy generation, consumption, or savings; energy efficiency; etc.). The ways of approaching a performance audit of the activities pursued by the public sector within the framework of sustainable energy – including audits of sustainable energy support measures – can be broken down into the following items:

- **Verification of the existence of defined policy goals and of instruments thereof; in particular, to obtain answers to the following questions:**

    - have the goals been defined based on an analysis of the start-of-project situation; have the environmental and social requirements been identified; has an analysis of the strengths, weaknesses, opportunities and threats (SWOT) been performed;
    - have optional solutions been taken into account; have appropriate policy implementation instruments been specified; have these instruments been chosen in an unbiased manner;
    - do the policies and their instruments have direct links to the goals set forth.

    Every sector will define its own goals and tasks in order to carry and enforce its interests. Observance of the sustainability principles assumes a mutual interlinking of policies in such as way as to avoid situations where the implementation of one policy (*e.g.*, that of the transportation sector) would infringe against the implementation of another policy (*e.g.*, that of the environmental protection sector). Thus the responsibility for environmental impacts is also transferred onto the authors of the sector policies. Assessment of policies amounts to assessing the specific phases, *i.e.*, identifying problems, proposing political solutions, defining policy goals and instruments, and evaluating the outputs, outcomes, and impacts

of policies as well as their effectiveness and efficiency.

Within the framework of the preparatory phase of the policy (programme, measure, activities) in question, the optional solution – including its future impacts – should be evaluated prior to adoption and implementation of the given policy. Subsequently, the given policy and its relevant measures (activities) should be assessed, particularly in relation to the starting situation and to the other policies. The pre-set goals should be tied with specific measures and activities, with relevant indicators attached; their weights as well as their initial and starting values should be determined correctly and conclusively.

In the area of development and support of sustainable energy, the pivotal issue is to determine the real utilization potential of the renewables. It is a basic prerequisite to take into account the completely different conditions under which renewable resources can be used in different states, as well as the support to setting the targets on the basis of the actual potentials of the states considered.

For instance

In the case of biomass, the fact to start from is that biomass wastes are used to the maximum possible extent and that any further expansion is only possible through energy crops grown specifically for this purpose. From the point of view of potential, it is immaterial in such cases whether this may involve a direct combustion of biomass, gasification and subsequent use of biogas, or transformation to liquid biofuels. Hence, from the standpoint of the biomass, it is the acreage of available arable land which constitutes the basic parameter. The potential of wind power is determined based on the tally of locations offering a given average wind velocity while respecting the constraints arising from protected landscape areas. The potential is ascertained based on available locations not yet used. The potential of solar photovoltaics, solar thermal energy, and environmental energy is determined based on the estimated investment growth in the area of erection of new facilities bearing in mind their average rates of usage within the given geography of the country.

- **Verification of the existence, completeness, and plausibility of preliminary analyses; in particular, to obtain answers to the following questions:**
    - has the socioeconomic effectiveness of implementing the policy been subjected to an ex-ante evaluation with respect to its orientation;

- has the evaluation been unbiased; has a suitable technique been used to evaluate the societal and economic effectiveness; were the background documents complete, correct, and credible;
- have all related costs and benefits been included; is there a linkage of the declared benefits to the proclaimed goals.

In particular, the evaluation should take the following into consideration:

- to what extent do the chosen goals correspond with existing societal and economic problems requiring solution; how would they contribute to improving the present situation;
- to what extent will the impacts of the measures, activities, and programmes chosen correspond with the need for resolving existing problems;
- what relations will be established between the inputs and the outputs of the programme (activity, measure) ;
- will the effect persist, and in what time horizon.

The assessment should be performed in compliance with quantitative and qualitative criteria. When adopting quantitative criteria for assessment, this will include assessments of economy (minimization of costs), effectiveness (to ensure an optimal ratio of inputs to outputs), and efficiency (the degree of attainment of the desired objectives). In case of qualitative criteria, the aspects to be assessed include the quality of service and the observance of pre-set standard and the accessibility of the value (service) by the user.

In connection with these assessments, the facts should also be considered that interventions may produce both positive and negative consequences and that real phenomenon is the product of the influences not only of public expenditures but also of a number of other factors (economic, social, historical, political, etc.).

- **Verification of the managerial and auditing system adopted in implementing the policies**, in relation to ensuring an economical utilization of funds including the demarcation and observance of rules and conditions applicable to the disbursement, spending, and utilization of these funds.

The audit should mainly aim to review the following:

- the method by which projects are assessed, evaluated, and selected for implementation;
- fixing the terms and conditions for the provision of support/assistance;
- the method of determining the amount of support, the demarcation of the objective

for which it should be used, and the method of sourcing the support funds;
  - the method whereby projects are evaluated;
  - the provisions to ensure effective audits of spending of the support funds.

- **Review of the functioning of the system adopted to evaluate the implementation of policies/policy outlines/programmes** from the point of view of continuous monitoring of the progress toward meeting the pre-set targets as well as from the point of view of the societal and economic benefits, *i.e*., in particular the setting and the application of the monitoring and evaluation indicators as well as the selection and use of methods to assess the effectiveness of the measures undertaken.

  The quality of assessment of objectives based on indicators hinges on two key factors: setting the indicators and evaluating the indicators. Indicators should be picked based on their relevance to key issues of the policy, on the quality and availability of data used to compute the indicators, and on the demands on personnel and funding posed by the task of processing the indicators. It is not just the financial flows that should be followed by means of the financial indicators, but also, in particular, the outputs, outcomes, and impacts of the various activities, measures, and programmes. The output indicators characterise the extent of the activity in question; the indicators of results or outcomes express the direct, immediate benefit of the measure in question; and the impact indicators go beyond the scope of instantaneous effects and furnish information on relationships across a longer time horizon.

  In particular, the evaluation of indicators should take the following into consideration:
  - to what extent is the indicator commensurate with the declared objectives;
  - how does it express the progress attained (in relation to objectives);
  - can lower-level indicators (such as measures) be summarised for evaluations of the global objective;
  - availability of the data required to quantify the indicator; would the data also be available from the regional and time coverage viewpoints; are the data based on reliable statistics; are they verifiable; have the correct units been used, etc.;
  - are the data representative of the problem in question and of the area addressed; would they lend themselves to international comparisons;
  - have the indicators been clearly defined; is there a clear description of their structure;
  - have the indicators been presented correctly and clearly.

  In the area of sustainable energy, the indicators used include, for instance, the indicators of

build-up in electricity and heat generation from renewables; of boosting the capacities for energy generation from renewables; of raising the installed thermal output thanks to renewables; of raising the installed electrical output capacity for renewables; or of abating, due to the use of renewables, the emissions of contaminants producing air pollution.

Evaluations of the effectiveness of the implemented measures are undertaken based on comparative methods, by contrasting the amount of spending with the benefits obtained. In the area of environment, the costs incurred to improve the environmental situation are compared with the environmental effects produced (such as the abatement of emissions of a given noxious substance adding to air pollution or to water contamination). Within the meaning of the principle of sustainable development, it is necessary to monitor the effectiveness of such measures bearing in mind the economic, environmental, and social aspects.

3.4 The audit conclusion phase

3.4.1 Treatment and processing of the audit results – the final report

During the concluding phase of the audit, the facts ascertained by the audit have to be suitably described and, above all, the conclusions drawn from the audit conducted with focus on sustainable energy have to be formulated. It is important than not only the specific irregularities and imperfections ascertained be reported but also, that any systemic failings be detected and if possible and that attention be drawn to them. As long as the SAI has the opportunity, it should also make efforts to derive generally valid conclusions and to point out possible remedies.

Any recommendations if presented should be supported by a logical and rational justification based on actual knowledge. The starting point for any recommendations is to identify the causes underlying the unsatisfactory situation detected. It is important to ensure that any recommendations submitted are practical, furnish added value, and are focused on the objectives of the audit. In certain cases, it will be necessary to present arguments in favour of and against various alternative proposals, for the reader of the audit report to be able after perusing the arguments presented to arrive at a better understanding of the final recommendations.

The subject of this phase is to combine the results obtained during the course of the analysis. There is no generally valid method of how to do this, a case by case approach has to be adopted; but it is of extreme importance for the auditor to work systematically and carefully when interpreting the collected data and arguments.

3.4.2 Reporting

Reporting represents a very important phase of the audit. The basic standard applicable to reporting is ISSAI 400 – INTOSAI Auditing Standards - Reporting Standards (Reporting Standards in Government Auditing)[11].

Ranking among the fundamental tasks of reporting is to assess whether the SAI knows who are the recipients of the audit report in the area of sustainable energy. The audit report recipients can be broken down into two groups:

- for instance, the government, parliament, or president of the country, and other pertinent bodies of state administration;
- the public.

Requests to provide reports to the public may constitute an important source of information. The pertinent subjects may stand under the obligation to report to relevant bodies wherefrom the reports may be retransmitted to the parliament or to some other relevant institution. This is why the processes of monitoring, reporting, and examining responsibilities, also including data gathering, carrying out analyses, and disseminating reports on the findings, should all of them be submitted to an audit. The audit should be geared so as to obtain an assurance that these reports and the assessments of results do comply with pertinent standards, rules, and regulations. In particular, the audit should aim to the following questions:

- do the pertinent bodies meet the requirements applicable to reporting their results;
- have these reports been elaborated in compliance with relevant standards and legislation.

In all cases, the audit reports must observe the pre-set quality guarantees and must comply with the reporting standards in force for the given SAI. It must be ensured that the audit reports are incontestable and cannot be challenged. The quality guarantee is linked with the method, system, and procedures adopted by the given SAI in order to secure and maintain a high standard of auditing activity.

The SAI should also adopt a defined approach to the ways in which it intends to disseminate information to the public. Most SAIs publish their audit conclusions on their web pages, or as the case may be, they can also be requested in hardcopy form in the official language of the country of

[11] http://www.issai.org/media(632,1033)/ISSAI_400_E.pdf

origin. Here our recommendation would be that for every such report, a executive summary be conducted to find out more about the major facts ascertained by the audit; this would be in one of the INTOSAI official languages (Arabic, English, French, German, or Spanish). This body of information would then serve the other auditors as a source of information in support of their auditing activity.

Example – all that an audit report may contain – audit no. 08/38

Examples of findings – the audit report will be published in August, 2009

3.4.3 Impact assessment and monitoring

It is up to the SAI's decision whether (but it is recommended that), on completion of an audit focused on the area of sustainable energy, an ongoing monitoring activity and evaluations of subsequent trends encountered in the area that has been audited would continue. In the post-audit period, the auditor or the audit group follows up the ways and means in which the recommendations drawn based on the completed audit are implemented (as long as the SAI is authorised to do so), and it continues following up the trends in the given area, the developments of major indicators, etc.

Such monitoring also comprises the activity of following up whether this area is or would be audited by some other government institution, or whether the audits focused on the given topic are also conducted in other countries, and with what results.

This monitoring may result in repeating the audit in an area already audited, or in presenting topics well-suited for further potential audits.

For instance:

- following up the corrective measures if any adopted pursuant to the audit as well as the ways in which these measures have been implemented;
- undertaking impact assessments of such measures;
- following up the trends of spending from the state budget in the areas of renewable sources of energy, energy savings, etc.;

- monitoring of significant changes to the energy-regulating instruments (programmes, policy outlines, strategies, etc.).

3.5 Case studies of the audit carried out by various audit offices

Case studies are based on the work of SAIs from around the world. Case studies were chosen in order to cover the variety of topics focused on the area of sustainable energy.

Title of the audit: Energy Efficiency in Commonwealth Operations – Follow up Audit

Country and year of publication: Australia, 2002/2003

Type of audit: Performance

Audit form: Individual

Audit objective: The objectives of the audit were to assess the extent to which selected Commonwealth agencies have implemented the recommendations of Report No. 47 of 1998-99, taking account of any changed circumstances or new administrative issues identified as impacting upon implementation of these recommendations and to offer continued assurance to the Parliament on the management of Commonwealth agencies' compliance with the Commonwealth energy efficiency requirements, and to identify areas for better practice in energy management by those agencies.

Audit scope: The Audit "Energy Efficiency in Commonwealth Operations – Follow up Audit" conducted over 2002/2003 was executed to determine if the Government Departments used in the 1998/99 Audit had implemented the 7 recommendations, assure Parliament of compliance with Commonwealth energy efficiency requirements and to identify areas for better practice.

Audit criteria: Audit criteria were based on:

- The Energy Policy Objectives outlined in the 1998/99 Audit the ANAO performed;
- The 2001/02 Whole of Government Energy Use Report.

Methods used: The methodology was comprised of a questionnaire to ten agencies, analysis of their responses, follow-up interviews and review of relevant agencies and documents.

Findings: Main conclusions of the audit:

- Overall, agencies involved in this follow up audit have made satisfactory progress in implementing the recommendations of Audit Report No. 47 of 1998-99;
- The two co-ordinating agencies have effectively implemented the recommendations relating to their policy co-ordination and leadership functions.

Recommendations: The ANAO recommended that an agency's annual energy efficiency report to its portfolio Minister include an indication of whether all the requirements of the Energy Policy were complied with and, where this did not occur, an indication of the areas of non-compliance, and either the steps being taken to remedy the situation, the barriers to implementation, or a statement that specified requirements are not considered to be relevant to the agency.

Impacts: Since the audit was tabled in 2003, the Government has updated the energy policy with revised targets for tenant light and power and office central services.

Title of the audit: Environmental and Energy Audit

Country and year of publication: Brasilia, 2008

Type of audit: Performance

Audit form: Individual

Audit objective: The results of the new energy auctions in 2005 and 2006 to evaluate how the restriction on supply of electric energy (due to lack of environmental license):

- Affects the configuration of the planned matrix of the country;
- Increases the risks of no-supply;
- Increases the price level of the supplied energy.

Audit scope: The audit includes these subjects:

- Ministry of Mines;
- National Agency of Electrical Energy
- Ministry of Environment;
- Energy Research Enterprise;
- Brazilian Institute of Environment and Renewable Natural Resources;

Audit criteria: The criteria are the standards or indicators used to determine whether the programme, activity, project or auditee achieved or exceeded the expected performance. The assessment of whether or not the criteria were met results in an audit observation and in audit findings.

Methods used: During the audit following methods were used:

- Expert opinion;
- Risk analysis;
- Physical documents;
- Interviews and questionnaires;
- Activity report of auditees, annual reports;
- Statistical data.

Findings: Main conclusions of the audit:

- Preserving the security of the system and ensuring low prices should be the basic principles of the planning and implementation of the expansion of the Brazilian electrical matrix.
- There is still a need to improve the processes related to the implementation of the Brazilian electrical matrix as stipulated by the Decennial Plan of Electrical Energy Expansion and by the other public policies related to this area, with emphasis on the National Policy of Environment.

Recommendations: These recommendations were given:

- Objectively establish criteria for defining environmental compensation, with maximum limit allowed and gradation of the percentage equivalent to the environmental damage foreseen;
- Carry out feasibility studies for hydroelectric use;
- To improve the implementation of the Brazilian electrical matrix, aiming, above all, to meet the purposes of the Decennial Plan of Electrical Energy Expansion.

Title of the audit: Electrical Losses Audit

Country and year of publication: Brasilia, 2008

Type of audit: Performance

Audit form: Individual

Audit objective: The purpose of this performance audit was to evaluate the impact of the losses in Brazilian electrical system. The electrical losses are divided into technical and commercial losses. Technical losses are caused by dissipation of energy on the drivers, which is inherent to the physical characteristics of the installations, and is also related to the maintenance and quality of the equipment. The commercial losses are caused by fraud, theft and lack of measurement. The audit covered the years from 2003 to 2007.

Audit scope: The audit includes these subjects:

- National Agency of Electrical Energy.

Audit criteria: The criteria are the standards or indicators used to determine whether the programme, activity, project or auditee achieved or exceeded the expected performance. The assessment of whether or not the criteria were met results in an audit observation and in audit findings.

Methods used: During the audit following methods were used:

- Expert opinion;
- Risk analysis;
- Physical documents;
- Interviews and questionnaires;
- Activity report of auditee, annual reports;
- Statistical data.

Findings: Main conclusions of the audit:

- The level of losses in the electrical system is a determinant factor for the tariff level as well as for establishing the need for investment in new enterprises of generation, because, for a given demand, the larger the losses the more energy would be generated and injected into the system. Thus, a part will be consumed, billed and paid effectively, and another part will be dissipated in the drivers, stolen, not measured or not paid. A certain level of losses is unavoidable, but certainly is manageable and subject to regulation. Appropriate incentives must be offered to all the agents of the system to enable a better energetic efficiency, otherwise negative external economic and environmental factors will be felt throughout society.
- The actions performed by the Agency to reduce the electrical losses were not effectively implemented;
- The concessionaires were inefficient in combating the electrical losses, which is not in compliance with Law.

Recommendations: The main recommendation to Agency was that it put into practice its rules that had no been implemented.

Impacts: To estimate the magnitude of the commercial losses, caused by fraud and theft, which was about 19 TWh in 2007, is suffices to say that this amount is equivalent to the entire captive market of the State of Minas Gerais with their 6.2 million consumers during one whole year. On the other hand, the 25 TWh of technical losses are sufficient to supply for one year the States of Bahia, Pernambuco and Ceará. These States provide energy to 1.6 million consumers.

Title of the audit: Reducing Greenhouse Gases Emitted During Energy Production and Consumption

Country and year of publication: Canada, 2006

Type of audit: Performance

Audit form: Individual

Audit objective: The audit had the following objectives:

- Determine, through the examination of selected federal government programs intended to reduce the quantity of greenhouse gases emitted during the production and consumption of energy in Canada, whether the federal government can demonstrate that these programs achieved expected results.
- Determine whether the federal government can demonstrate that programs intended to reduce the quantity of greenhouse gases emitted during the production and consumption of energy are contributing, as expected, to the achievement of its broader short-term commitments and long-term goals for greenhouse gas emission reductions.

Audit scope: The examination covered a number of programs and initiatives funded and implemented through Natural Resources Canada (NRCan) from 2000 to March 2006. Under Objective 1, the Wind Power Production Incentive, the EnerGuide for Existing Houses program, and the Ethanol Expansion Program were examined, each of which were allocated funding of $100 million or more. Before the end of our audit work, the EnerGuide for Existing Houses program was discontinued.
Under Objective 2, there were examined programs intended to reduce greenhouse gas emissions associated with the oil and gas sector, advance wind power as a renewable source of electricity, and enhance energy efficiency in homes in Canada.

Audit criteria: Under Objective 1, we focused on two audit criteria drawn primarily from various federal government sources: one criterion related to results and the other related to financial management. In the first case, we expected NRCan to have fair and reliable information on the results achieved by the programs for which it is responsible.
With respect to finances, we expected the Department to have fair and reliable information on all appropriations and expenditures associated with the administration and implementation of the programs for which it is responsible.
Under Objective 2, we expected that, where the federal government has made associations among programs, NRCan has fair and reliable information on how these programs contribute to the achievement of the government's larger goals for greenhouse gas emission reductions.

Methods used: In carrying out audit, government officials from Natural Resources Canada, Environment Canada, and a number of other departments were interviewed, and reviewed program files, reports, financial statements, and other documents. As well, we interviewed selected recipients of government funding under the programs audited, provincial government officials who were responsible for similar programs, other key stakeholders, and officials of countries considered leaders in the areas of wind power, energy efficiency, and energy policy.

Findings: Natural Resources Canada (NRCan) is accountable for achieving greenhouse gas emission reductions from the Wind Power Production Incentive, EnerGuide for Existing Houses (until it is wound down), and the Ethanol Expansion Program. Though these programs are only a sample of those under the Department's responsibility, they represented more than $800 million in authorized funding. NRCan's performance expectations for emission reductions from these programs were confusing. While the Department achieves results, it does not consistently report publicly on program performance against emission reduction and other targets. This hinders Parliament's and Canadians' ability to hold the Department accountable for climate change results.

Natural Resources Canada monitors and reports on funding and expenditures for the programs we examined in detail. However, the financial systems and processes are overly complicated, making it difficult to track and report authorized funding and spending at the program level.

Oil and gas production, particularly the rapid development of Canadian oil sands, is significantly increasing greenhouse gas emissions. However, federal initiatives aimed at this sector have achieved minimal reductions to date and have not yet contributed as expected to federal climate change objectives. The

federal government, under the leadership of NRCan and in co-operation with the provinces and territories, is not clear on how it intends the country to balance the need to reduce these greenhouse gas emissions with the growth expected to take place in the oil and gas sector.

Recommendations: Following recommendations were given:

- Natural Resources Canada should lead the development of a wind power strategy for Canada, in collaboration with the provinces and wind industry. The strategy should provide a vision for wind power in Canada and identify what governments will do to support it, and over what timeframe.
- Natural Resources Canada should complete the evaluation of the Wind Power Production Incentive that it committed to in 2002. It should also complete a thorough economic analysis to clarify the extent to which the economics of wind power are changing across Canada and whether there are implications for this program.
- Natural Resources Canada, on behalf of the Government of Canada, should make clear to Parliament by the end of 2006 how and to what degree the country will reduce greenhouse gas emissions in the oil and gas sector, both in the immediate and longer term. At the same time, NRCan should develop a corresponding implementation plan.
- Natural Resources Canada should ensure that clear and concrete greenhouse gas reduction targets are established for each of its programs funded for this purpose. The Department should provide clear and detailed information to Parliament about the performance of its programs compared with greenhouse gas emission targets, and the costs incurred.
- Natural Resources Canada should establish consistent practices for financial management and reporting of authorized funding and spending at the program level.

Title of the audit: Audit investigation on bio-energy (gasification of crop stalks) collective supply project

Country and year of publication: China

Type of audit: Performance

Audit form: Individual

Audit objective: Through audit investigation on the construction process, the raising, managing and using of funds for bio-energy (gasification of crop stalks) collective supply project in A City, and through the analysis of the economic and social benefits of the project, the economy, efficiency and effectiveness of the project will be assessed, the project's roles on energy conservation, pollution reduction and environmental protection will be evaluated, and problems emerged from the construction and operation of the project will be exposed. Auditors will, accordingly, analyze the causes of those problems and put forward corresponding recommendations, and provide the government some fundamental and actual material regarding sustainable energy promotion in rural areas of China.

Audit scope: Financing status: to review the financing status of every collective stalk gasification supply project, and to reveal problems emerged from financing process. Investment and construction status: to check the investment and construction status of the project, including the investment on equipment, construction and installation, the administrative fee during construction, and other expenditures; to verify problems emerged during project implementation process. Production cost and performances analysis: to verify the cost of project, including raw materials (crop stalks) used and related expenditures occurred; to evaluate the benefits of the project, including the volume of methane and its by products generated by a project, as well as the number of households and population that a project's gas output could supply. Social benefits analysis: to assess the number of households benefited by the project and the volume of crop stalks consumed annually by the project, through a set of scientific statistical criteria to convert methane energy generated into weight of standardized coal conserved; to survey and analyze the price of methane generated by crop stalks, compare it with the price of liquid petrol gas (LPG), and calculate the money saved annually due to the using of methane for cooking in rural areas; to evaluated the roles that the project played after implementation on reducing pollutant (including SO2, CO2) emission and solid wastes (oven cinders) generation.

Audit criteria: The following laws and regulations are used as audit criteria of this audit project:

- Audit Law of the People's Republic of China;
- Renewable Energy Law of the People's Republic of China;
- Environmental Protection Law of the People's Republic of China;
- Atmosphere Pollution Prevention Law of the People's Republic of China;
- The State Council's Regulations on Banning Crop Stalks Burning and Promoting Comprehensive Utilization of Crop Stalks;
- Thermal Units, Symbols and Their Conversion (GB/T2586-1991), etc.

Methods used: Following methods were used during the audit:

- Document Review
- On-site Observation/ Field Check;
- Inquiry;
- Analytical review, etc.

Findings: Audit finds that crop stalks gasification and collective supply project improves the living standards and quality of farmers, reduced the rural environmental pollution caused by crop stalks random storage and open field burning. The project produced clean energy through bio-energy conversion, saved limited energy, like coal, and promoted sustainable use of energy, which plays active roles in building a resources-conserving and sustainable society. In the aspect of economic benefits, the audit investigation found that the first phase of collective gas supply project of A village, A city had a loss of 2868.2 RMB Yuan due to the low gas price and consumption volume. The auditor assessed that it needs at least 105 household users to make both ends of the gasification project meet. If all 400 household of the village use methane, a 30000 RMB Yuan profit will be made annually. In the aspect of social benefits, the audit investigation identified that the project can: firstly, conserve energy (the project consumes 300 tons of crop stalks annually, which may

conserve about 150 tons of standardized coal.); secondly, reduce daily expenditure for rural households (as measured and calculated, gasified stalk methane only costs a common household of three persons 30 RMB Yuan (4.4 USD) per month, which is 40 RMB Yuan (5.9 USD) lower than that of LPG.); thirdly, protect the environment (after the implementation of the project, emission of pollutants like CO2 and SO2 and generation of solid wastes are remarkably reduced, the pollution caused by fossil energy consumption is alleviated and atmosphere quality deterioration caused by crop stalk burning is effectively prevented.). However, audit investigation identified some problems in the project. Firstly, due to inadequate recognition of crop stalk gasification techniques, farmers showed limited interests in using crop stalk methane. Secondly, the investment for crop stalk gas collective supply stations construction is not sufficient. The subsidies from provincial and municipal government are comparatively low, some counties and towns could not provide counterpart investment due to uptight public finance. Thirdly, the applied techniques on crop stalk gasification need to be further developed and improved.

Recommendations:

- The government shall improve its planning on crop stalk gasification and collective supply stations. The construction plan must be considered together with the strategic planning of rural development, so as to enlarge the scale of collective inhabitation and increase the stalk methane supply to an economic operation scale which will reduce the cost of methane production.
- The government shall invest more public funds in the project to help the construction of gas station and increase subsidy level. Meanwhile, the government shall encourage private sector investment in this area to promote the development of renewable energy in a larger scale.
- The government shall organize related institutions and entities to carry out collaborated technical research in this area, in order to improve the techniques of gasification and standardization of equipment. Research institutions and equipment manufacturers shall collaborate and improve the technique performance of equipment through technical introduction and self-research and development.
- The government shall strengthen project's safety management to ensure safe operation of the project. First, safety monitoring and management system for crop stalk gasification and collective supply stations should be established and strictly complied. Routine check-ups should be conducted in gas stations. Secondly, workers' training plan and working certification system should be established to regulate the operation of gas station to ensure safety production. Thirdly, specifications for gas using should be prepared and introduced to all household, in order to ensure the safe using of gas.

Title of the audit: State actions for obtaining efficiency of energy end-use

Country and year of publication: Estonia, 2008-2009

Type of audit: Performance

Audit form: Individual

Audit objective: The objective is to assess whether the state has implemented appropriate means to achieve necessary efficiency of energy end-use. The second objective is to assess whether the public sector has taken the exemplary role and implemented appropriate energy efficiency improvement measures.

Audit scope: The audit scope included:

- Ministry of Finance, Ministry of Economic Affairs and Communications, *Riigi Kinnisvara AS* (State property joint-stock company).
- The audited period was 2006–2008.
- State actions toward energy end-use efficiency; State actions towards energy end-use efficiency in the public sector.

Audit criteria: State NEEAP's measures ensure energy savings target of 9% for the year 2016; Public sector fulfils an exemplary role in the context of energy end-use efficiency.

The sources of criteria were:
Directive 2006/32/EC on energy end-use efficiency and energy services.

Methods used: Following methods were used:

- Benchmarking
- Decision analysis
- Performance analysis
- Legal analysis (public procurement legislation)
- Performance assessment (good practices in Finland, Austria)

Findings: The aims and expected results will not be achieved with the NEEAP;
Public sector has not been implemented energy efficiency improvement measures and does not fulfil an exemplary role. Estonia has not been assigned responsibility for the integration of energy efficiency improvement requirements to any organisation.

Recommendations: These recommendations were given:

- to amend the NEEAP with appropriate and measurable measures;
- to build up an information collecting, analysing and publishing system;
- to assign an organisation responsible for energy efficiency in public sector;
- to implement appropriate measures on public procurement process.

Title of the audit: Audit on the system of electricity supply

Country and year of publication: Hungary, 2007

Type of audit: Performance

Audit form: Individual

Audit objective: The audit objective was to asses whether a smooth operation of the electric energy production and provision activities at a reasonable price level was adequately ensured by the operational arrangements of, and changes to the electricity supply system, the public governance, the division of governmental tasks and the ownership arrangements for production and provision activities.

Audit scope: The audit scope included:

- Ministry of Economy and Transport, Ministry of Environment, the Prime Minister's Office, Ministry of Finance, MAVIR Hungarian Transmission System Operator Company, Ltd., Hungarian Energy Office, Hungarian State Holding Company and Vértesi Power Company Ltd.
- The audited period was the period of 2003 to 2007, the prior and following periods were taken into account where relevant.
- The audit covered the management, the structure, the regulation and the system of methods of the supervision; the evaluation of the strategic validity of the electric energy system, of its resources, environmental background as well as the evaluation of the operation, its technological background and security together with the relevant pricing policy and price regulation.

Audit criteria: The criteria set in the government decree of the Act on Electric Energy and the execution of the act, in EU directives, professional explanations and methodologies, furthermore in rentability calculations and in regulations concerning privatization.
The sources of criteria were:

- Rules set by law, regulations, or the government
- Indicators and parameters set by government

Sources of renewable energy (e.g. biomass, wind energy) help hydrocarbons and their utilisation is receiving more and more attention. At the moment of its accession to the EU Hungary made only a minor pledge in this respect; namely to increase by 2010 the share of biomass-based energy to 3.6 % in the total produced electric energy. A 5.9 % rate was achieved already in 2005.
Utilisation of wind power energy was promoted by a 2005 amendment to the Act on Electric Energy, which set a high, compulsory price for purchasing such energy. However, the ability to regulate the wind power plants is restricted due to their dependence on the weather conditions, therefore the Hungarian Energy Office set a 330 MW cap on the production capacity of an individual wind power plant.

- International conventions
- Price data

Methods used: Legal analysis (analysis of legal environment), risk analysis, benchmarking (international), economic analysis, statistical analysis and performance assessment.

Findings:

- The engineering and economic toolkits of electricity supply system have contradictions and drawbacks, which badly affected the operation of the two-level market model and the extent to which the market liberalisation was prepared.
- It is a plus that the utilization of renewable energy resources, and within this category, that of the biomass and wind energy have increased. On the other hand it is negative that from 2005 onward it was less ensured that the changing loads and malfunctions were regulated.
- Due to the expected decrease in capacities and the aging of the appliances and the need to ensure reserves require the building of additional capacities.
- Due to the exposed market it is necessary to provide for the socially needy consumers.

Recommendations:

- We recommended for the Government and the Minister of Economy and Transport to treat with special attention the national analyses and European experiences in the interest of optimising long-tern impacts, when developing decrees on how implement the Act in Electric Energy.
- In addition the SAO stressed that re-negotiation on LTEPAs (long-term electricity purchase agreements) should result in business decisions that comply EU-rules, do not load burden on the Hungarian budget and pay attention also on to the consumers' interest.

Impacts:

- As a consequence of the recommendations of the audit report in effect of 1st January 2008 the Government promulgated 5 government decrees and 7 ministerial decrees in order to be able to transform the domestic electric energy market in harmony with the EU regulations.
- Upon the recommendations addressed to the minister, he had an action plan prepared in which he reported, that the public organizations dealing with electric energy will observe the findings and recommendations in the course of their future operation.

Title of the audit: Performance audit of the Centre Renewable Energy Development

Country and year of publication: Morocco, 2006

Type of audit: Performance

Audit form: Individual

Audit objective: Main objective was to make a general diagnosis of the Centre of Renewable Energy Development (CDER) in order to formulate suggestions and recommendations in order to improve the management and to increase the efficiency of the centre to support energy savings and use of renewable energy resources.

Audit scope: The audit scope included

- Bodies of direction;
- Legal mission;
- Countable and financial organization;
- Information system;
- The audited period was the years from 2000 to 2005, the prior periods were taken into account where relevant.

Audit criteria: Law, regulations, Standards and indicators, International benchmarking.

Methods used: Legal analysis (analysis of legal environment), Risk analysis, Performance.

Findings: Even if the renewable energy sector becomes very dynamic and offers numerous opportunities of investment, Morocco has not taken enough advantage of the development of this field. The analysis of realization of the centre since its creation shows that the results remain very limited. Concerning research, adaptation and diffusion of renewable energy techniques to the Moroccan context, the action of the centre of renewable energy development remained also very limited.

Recommendations: The Court of Account of the Kingdom of Morocco recommended:

- Necessity of a national vision concerning renewable energies;
- Focus the activities of the CDER around its legal mission: Establishment and execution of programs of studies and scientific and technical research;
- Establishment of a clear strategy, objectives and a work plan for the CEDR;
- Improvement of the investment in the renewable energy development.

Impacts: Definition of a new strategy taking account of recommendations formulated by the Court of Accounts.

Title of the audit: Government actions to handle large scale power failures

Country and year of publication: Sweden, 2007

Type of audit: Performance

Audit form: Individual

Audit objective: The objectives were to audit whether government and the responsible agencies have sufficient basis for action plans to prevent large scale power failure. The audit also scrutinized whether government preparations gave the necessary requirements to handle a power failure on national scale, should such a crises occur.

Audit scope: The audit scope included:

- Ministry of Enterprise, Energy and Communications, The national agency “Svenska Kraftnät”, The Swedish power industry;
- The audited period was 1998 to 2007, the first five years relating to international threats to power supply;
- Action plans to prevent large scale power failures, as well as the necessary requirements to handle a power failure on national scale, should such a crises occur.

Audit criteria: The criteria set in the National programme – crises preparedness decree as well as electric power act that regulates demands for preparedness in agencies and power industry. This audit was carried out with criteria that to a large extent were set by the Swedish national audit office and covered reasonable demands for national crisis security, such as:

- Objectives and demands set as well as distribution of responsibility should give prerequisites for preparedness to handle crisis;
- God preparation should be made to provide robust power supply systems;
- Risk analysis should cover the risks to power supply and be the basis for action plans;
- A god capacity should be present within agencies to operational handle crisis;
- Personal and material resources should be present in the extent required to handle crisis.

Methods used: During the audit following methods were used:

- Physical documents;
- Expert opinion;
- Interviews and questionnaires;
- Information from public sources;
- Activity reports of auditees, annual reports.

Findings

- The Swedish government has not a solid base for decisions concerning whether or not actions taken are sufficient to prevent large scale crises in national power supply.
- In case of a power failure on national scale the Swedish agencies has a certain degree of preparedness to handle the crises, but summing up, the ability to cope with the crises is insufficient.

Title of the audit: Renewable Energy: Options for Scrutiny

Country and year of publication: UK, 2008

Type of audit: Other – see the explanation in audit objective section

Audit form: Individual

Audit objective: The report was a briefing for the House of Commons Environmental Audit Committee. It set out what is meant by renewable energy, the targets and objectives for renewable energy in the UK, progress to date against these targets, and the barriers to the further expansion of renewable energy in the UK. The report described the policy landscape, the responsibilities of the various organisations involved, and the range of programmes and policy instruments in place.

Audit scope: This briefing is not a performance audit, and the main objective was to set out the policy landscape clearly and describe the range of policy instruments in place. It also covers renewable energy generation.

Audit criteria: The briefing was descriptive rather than evaluative, but did set out key targets for the UK:

- The EU's proposed target is for the UK to achieve 15% of its energy consumption from renewable sources by 2020; the current figure is 1.4%;
- Other targets have been set, by both the EU and the UK, for the proportion of energy used for transport and supplied for electricity that should be sourced from renewable sources.

Methods used: These methods were used during the audit:

- Content analysis – documents on renewable energy ;
- Statistical analysis of secondary data;
- Economic analysis – cost comparisons.

Findings: This briefing was descriptive rather than evaluative, though it does highlight the scale of the challenge facing the UK in meeting the EU renewable energy target and the nature of the barriers preventing faster take-up.

Annexes

The annexes will be completed later on (e.g. the assessment of questionnaires received, list of international agreements and conventions etc.)

Glossary

The glossary will be completed later on.

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