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CURRENT SITUATION IN THE ENERGY SECTOR AT INTERNATIONAL AND NATIONAL LEVEL

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Abstract: The energy sector has long established itself as a strategic area of social and economic development for most countries in the world. So it has also become established in our country. The dependence of the whole of society on this sector and its complex impact on the environment have led to its position as the leading national infrastructure. Nowadays the concept of sustainable development has a global significance and ensures a dynamic balance between the components of natural capital and socio-economic systems. Choosing a strategy for energy development is a political decision that must be based on the development directions of the other industrial sectors that will become future energy users.

Key words: energy efficiency, sustainable development, energy trilemma, effective energy management, cogeneration.

1. INTRODUCTION

The energy sector in any country, including globally, is today facing three fundamental challenges that unfortunately appear to be divergent.

The concept of the energy trilemma, which recognises these challenges, was launched by the World Energy Council (WEC), which has studied in detail the conditions and how to address them [3, 5].

Improved favourable response to any one of these challenges inevitably affects the other two. Ways must therefore be found that lead to a compromise acceptable to the whole "trilemma" and - moreover - achieve sustainable energy systems [3].

Continuous technology development is an integral part of any business model, both for production and consumption. Technology is one of the main factors affecting the competitiveness of the final product on the global market.

Each new generation of products is implicitly more energy efficient than the previous generation because energy efficiency is an important cost factor over the lifetime of the product.

Energy efficient technologies can be found throughout the energy conversion chain. So from exploration and production of primary energy resources to electricity generation and from oil refineries to power grids and end-use in industry, buildings and transport.

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But it is not only the technical potential that is crucial for the successful introduction of energy-efficient technologies. Assessing the full potential of such technologies is essential. In order to identify the route to successful market introduction, it is necessary to consider the economic, feasible and also realistic potential.

The technical potential of Best Available Technology (BAT) requires certain conditions [6].

Oil and gas exploration should be done in such a way that the energy efficiency of the upstream power system is about 20%, ranking last in the whole energy value chain. By implementing a system-wide approach, energy efficiency could be increased by up to 50%.

The overall average efficiency of power plants (LHV) (net calorific value) in electricity generation is about 34% compared to BAT for coal-fired plants (46%) and gas-fired plants (61%).

Losses related to electricity transmission and distribution networks amount to 12% of the global average; BAT for high voltage transmission is less than 4% per 1000 km.

Energy efficiency management systems increase energy efficiency by at least 5% regardless of size, technology or process.

Buildings account for about 40% of total global energy conversion. It is estimated that energy savings in buildings can range from 20 to 40%, or between 1 and 2 Mtoe per year, equivalent to the annual energy demand of a country like Namibia.

The economic and realistic potential of best available technology (BAT) requires a wide range of measures [6].

In many cases a full system analysis is required to optimise the full potential for energy conservation.

The IEA (European Association of Electrical Contractors) presented in Scenario 450 that improving energy efficiency is the least costly energy reduction option [8].

Energy efficiency accounts for half of the overall cumulative reduction share associated with the New Policy Scenario or 73 Gt between 2011 and 2035 (Fig.1).

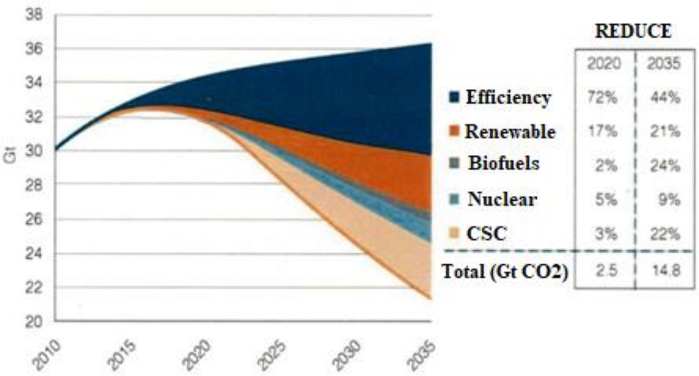

Fig.1. Scenarios for the evolution of CO_2 emissions

The role of energy efficiency varies from country to country in terms of remaining potential, energy pricing and other parameters.In OECD (Organisation for Economic Co-operation and Development) countries, despite the significant efficiency improvements that already exist, the efficiency improvements in the 450 Scenario represent about 42% of the reduction potential associated with the New Policy Scenario.

Their share amounts to 54% in non-OECD countries (including Romania) where efficient energy production and use of technologies are generally not widely implemented. This is due to higher costs of efficient technologies and energy subsidies that do not encourage energy efficiency.

Smart metering, efficient buildings, heat pumps, efficient motors, LED lighting and other applications can also contribute to high energy efficiency. Life cycle analysis can help define the specific contribution of each technology and analyse the cost-effectiveness of technologies. That is, reducing total energy costs provides a positive return on investment. Electric vehicles (depending on the electricity generation mix) can be another example of energy-efficient future mobility solutions [9].

2. INTEGRATING ENERGY EFFICIENCY THROUGHOUT THE ENERGY VALUE CHAIN

Whether energy or environment, energy efficiency is always mentioned as something that can be easily implemented. For most it seems to offer immediate and quick success. But because of the hurdles we face, it doesn't support this claim. There is considerable technical potential for improving energy efficiency throughout the energy value chain, from oil, gas, coal, uranium, etc. to the end consumer. Few research projects or studies have been able to estimate the potential with the necessary level of technical detail. Few have been able to estimate energy efficiency savings and communicate these findings in a way that makes them easy to understand.

Examining product productivity and cost can provide useful information about the efficiency of the whole process. It helps to assess the impact of energy efficiency improvements and to develop an easier understanding of the "motric factors", the evolutionary factors that acts these improvements.

It also helps reduce fuel consumption and increase availability and profitability in the sector.

Over the years, a number of questions have been raised about measuring and recording the impact of energy-efficient technologies and the savings that can be achieved by deciding to use a particular technology, whether practical or available [1].

The energy value chain is a sequence of productive activities that starts with the exploration and production of raw materials (primary energy) for further processing, transportation (liquefied natural gas - LPG, gas to liquid - GTL, liquid thermal fuel - LTF), distribution and use (Fig.2).

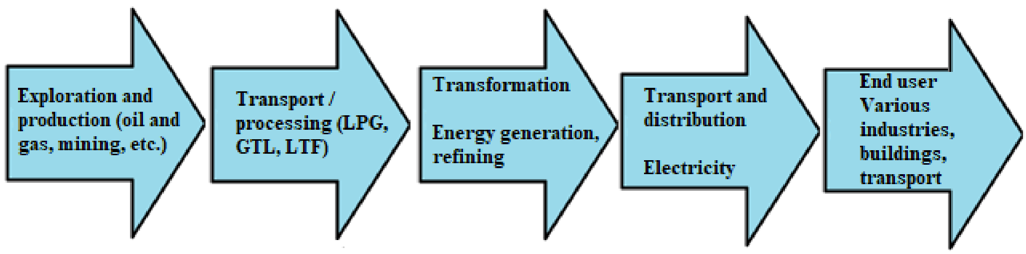

Fig. 2. The energy value chain.

The more developed the value chain, the greater the benefits that can be achieved through improved energy efficiency [9.]

A sustainable energy system, based on the energy efficiency approach, requires the optimal integration of all resulting components into an integrated energy system.

In order to set up an integrated energy system, the following must be completed:

- identification and specification of energy requirements;
- reviewing possible options for increasing efficiency throughout the energy conversion chain and selecting the most appropriate option tailored to the performance requirements;
- system optimisation using tools such as information and communication technologies, e.g. control, real-time optimisation and smart grid technologies, in all sectors and infrastructures throughout the energy chain and in all regions.

It is important to carry out assessment projects without delay, taking into account the key benefits provided by energy efficiency improvements, from reduced CO_2 emissions to billions of dollars in potential savings from lower energy bills [2].

To achieve faster progress in energy efficiency, guidance, communication and information should be a priority, even more important than incentives.

This is where governments can and should take a more proactive approach. All energy investments and energy efficiency measures should be based on cost-benefit analysis that includes environmental costs.

3. EFFICIENCY IN INDUSTRIAL ENERGY USE

Industry uses a large amount of energy to power various manufacturing and resource extraction processes. Many industrial processes require large amounts of thermal and mechanical energy, much of which is provided by natural gas, petroleum fuels and electricity.

Some industries generate waste streams that can be recovered to provide additional energy [4].

Because industrial processes are so diverse, from processes that need cold or low temperatures to processes that require high temperatures, it is difficult to describe the myriad opportunities for energy efficiency improvements in industry.

There are several processes and energy services that are widely used in many industries (Fig.3). Many depend on the specific technologies and processes in each industrial facility. However, efficient energy management in industry, regardless of size, technology or process will increase energy efficiency by at least 5%.

Implementing cogeneration, reducing the level or amount of industrial heat or recovering waste heat offers important energy efficiency opportunities in many countries. Various industries cogenerate steam and electricity for further use in their own plant [9].

When electricity is generated, the heat, as a by-product, can be captured and used for process steam, heating or other industrial purposes. Cogeneration converts up to 90% of fuel into usable energy.

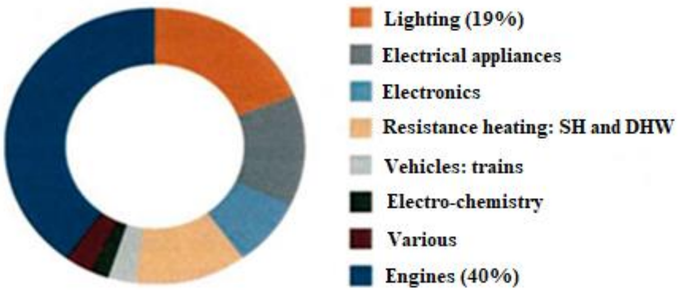

Fig. 3. Global electricity demand.

Advanced boilers and furnaces can operate at higher temperatures while consuming less fuel. These plants are more efficient and produce fewer pollutants.

Electric motors are by far the most important type of electrical load in the industry using about 70% of the electricity in the process. In the tertiary sector, electric motor systems use almost a third of the electricity processed.

Electric motors usually run at a constant speed, but the variable speed drive allows the energy at the motor terminals to match the load required. This results in energy conservation of between 3 and 60% depending on how the motor is used. Electric motor coils made of super-conducting materials can also reduce energy losses. In addition, motors can also benefit from voltage optimisation [3].

The industry uses a large number of pumps and compressors of all shapes, sizes and applications. The efficiency of pumps and compressors depends on many factors, but improvements can often be made by implementing better process control and maintenance practices. According to the US Department of Energy, optimizing compressed air systems by installing variable speed drives, along with preventive maintenance to detect and eliminate air leaks can improve energy efficiency by 20 - 50% [7].

Energy efficiency is sometimes seen as an easy way to achieve immediate energy savings. Technically efficient solutions are available today for most applications and uses. Technological developments offer and will in the future offer various technical solutions to improve energy efficiency, but there are barriers: organisational, financial and behavioural that need to be addressed holistically.

4. CONCLUSIONS

Implementing the concept of sustainable development requires the development of the following appropriate policies for the energy sector:

- stimulating the production of electricity from renewable energy sources as a solution to reduce greenhouse gas (GHG) emissions;

- encouraging energy efficiency, linked to the introduction of new technologies, but also with important financial symbols, which is one of the most difficult problems facing the energy sector;

- ensuring energy security, operational reliability and energy quality;

- the accessibility of electricity to users, a major requirement for this sector in order to improve society's standard of living;

- appropriate reforms of the energy market, a complex market economy issue;
- the problem of energy resources, the choice of electricity production structure, the use of high-performance technological means;
- ensuring minimum environmental impact.

Ambitious energy efficiency targets go beyond technical solutions and go further in terms of cost-effectiveness, financing, acceptance, innovation and environmental impact assessment.

The profitability of investing in energy efficient technologies is often unknown or questioned. Government agencies should promote comprehensive cost-effectiveness studies, including cost/benefit assessments.

Funding energy efficiency requires a long-term commitment and the funding framework should take this into account. The duration of loans should cover the whole lifetime of the solution.

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