WORLD EXPERIENCE OF ENERGY-SAVING TECHNOLOGIES

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Successful development of Ukrainian economy depends greatly on the solution of energy resources issue. Due to the lack of its own resources Ukraine has to import them. According to the structure of Ukrainian imports, energy resources are the biggest item contributing to total import growth of our country; its share accounts for 36 % of total goods imports, i.e. more than 1/3 of Ukrainian GDP is spent on energy sources imports.

Due to abovementioned, energy saving policy must be a first-priority issue for Ukrainian policy-makers, as well as a highlight of decision-making process overall. Ukrainian energy complex is characterized by enormous energy consumption. The most significant energy losses are registered in electric energy generating systems, as well as in house heating and hot water supplying systems. Aforesaid can be easily explained by the fact that electric energy is generated at condensational power plants, where less than 30% of the heat is used efficiently; the rest is dumped into the environment. Meanwhile, house heating and hot water supplying production accounts for 75 mln tons; 30-50% of system's power is usually lost due to the exploitation of low-efficient, used, out-of-date equipment, poor state of engineering networks etc.

Using new generating alternatives makes it possible to improve power plants efficiency, to obtain higher output and to increase "environmental friendliness". There are two main types of fuel used to produce energy in Ukraine: coal and natural gas. That's why gas and coal fired power plants are at the centre attention in this article.

Coal fired power plants form a part of generation portfolio in Ukraine, but have a disadvantage of relatively high levels of carbon dioxide emissions. However, a number of solutions – both short- and long-term ones – can put coal on a level with other technologies. Among all energy sources comprising nuclear, coal, gas and renewables, coal has a number of attractive features:

- It is easy to store and transport and can be sourced from diverse stable suppliers worldwide.
- Pulverised coal fired power stations offer unique load carrying flexibility, particularly useful in meeting peak demand, and in compensating for the intermittency of renewables.
- Coal fired generation (including emission control equipment to the latest stringent standards) is the lowest cost option for electricity generation.

Against the advantages, coal suffers from a significant disadvantage of having the highest level of carbon dioxide (CO_2) emissions, close to 1.4 t of CO_2 per MWh generated for the majority of Ukrainian plants. For coal to have an environmentally acceptable future, CO_2 emissions from new and existing coal fired power plants have to be reduced to as low level as possible. There are three complementary solutions to reduction of CO_2 emissions from these plants:

- Improving generation efficiency either via building new plant or upgrading the existing one.
- By substituting a fraction of the coal with biomass (biomass co-firing), biomass being CO2 neutral.
- Use of advanced concepts in plant integration.

Simultaneous adoption of all three improvements outlined above would reduce CO_2 emissions by 50-60% to a level comparable to a modern gas fired plant.

Advanced gas turbines market keeps being a driving force of significant technological change, caused by a call for new efficient technologies. The market's motivation for technological change has proved both the catalyst and the incentive for evolution of advanced gas turbine designs, made available to the market by several original equipment manufactures. And as these gas turbine lines have evolved in capacity, output, and performance, market expectations for "availability and reliability", set by pro forma requirements remain high. Availability and reliability is tied to the owner profitability objectives for the plant. Combined cycle gas power plants provide the most efficiency comparing with other gas fired power plants.

Benefits of combined cycle gas power stations:

- Competitive kilowatt hour: in combined-cycle applications new gas turbines have as much as a 10% advantage in efficiency over conventional turbine technology.
- High reliability and availability: lowest possible turbine inlet temperatures and a uniform annular temperature profile extend unit operating life.
- High power density: compared to conventional gas turbines new turbine design provides up to 60% more output in the same footprint. High power density design leads to reduced steam cycle requirements and lower capital costs.
- Low maintenance costs: the compact annular combustor provides a uniform hot gas temperature profile increasing the lifetime of the hot gas path turbine blading stages.
- Lower environmental emissions: the gas turbine concept for low emissions is based upon a unique combination of basic thermodynamics, combustion technology and design features. Sequential combustion technology is the industry's most innovative platform for low emission, high efficiency gas turbines.

However, the strategic prospective of energy saving policy must involve not only implementation of new environment-friendly and effective equipment, but also development of using unconventional and renewable energy resources, as well as new generating alternatives in order to substitute for conventional fuel types and economize the energy resources. The latter will contribute considerably to conventional energy sources saving and cut back the import expenses in the state budget.