Conference Summary

Conference objectives

On 19-20 September, Ambassador Richard Jones, Deputy Executive Director, IEA, opened the "Efficient Power Generation" Conference alongside Alexey P. Antropov, from the Russian Federation Ministry of Education & Science, and Andrey Kulakov, from Inter RAO UES.

This Conference was organized by the International Low-Carbon Energy Technology Platform (convened by the IEA) in partnership with the Ministry of Education and Science of the Russian Federation, Inter RAO UES and the Kurchatov Institute. Its main goal was to discuss how to enhance energy efficiency and accelerate decarbonisation of the power sector in Russia and the neighbouring countries.

To this end, the newly created Russian energy technology platforms (covering nuclear, bioenergy, smart grids, thermal power and distributed energy) were presented and discussed by a panel of participants from the Russian Government, leading Russian energy companies, institutes and organizations (including Skolkovo and the newly created Energy Efficiency Centre within Inter RAO UES) and international experts from UNDP, the European Union, IEA-Implementing Agreements (including ISGAN, Clean Coal Centre, District Heating and Cooling), European Bank for Reconstruction and Development, Nordic Investment Bank, Enel, Alstom, Hitachi, Siemens and others. A wide range of IEA experts were also involved.

This document provides an overview of the Conference discussions, summarises a number of key points raised during the debates, and outlines next steps currently under discussion. The detailed workshop agenda and speaker presentations can be found on the IEA-Technology Platform website: www.iea.org/platform.asp and on the Conference website http://www.epg-info.com/en/

Overview of Conference discussions

Summary of the first day discussions

The first day was dedicated to presenting the situation of the power sector in Russia, and the region, to set the scene for the debates of the Conference. There is a high political commitment towards enhancing the efficiency of the power generation system in Russia. This commitment is supported by a strong involvement of leading Russian energy companies to comply with international emission standards, to improve the efficiency of existing infrastructure and to integrate new technologies in the existing power system (including wind and bioenergy). Keynote addresses highlighted support for further cooperation between Russia, the European and international energy technology collaborative tools and international energy companies.

IEA's presentation highlighted the challenge of constant growing in demand for electricity. This is particularly true for Russia. Decarbonisation and enhancement of power generation in Russia need to start by the replacement and modernisation of existing power plants, before integrating new low-carbon technologies. Russia, like other countries, will have to face some contextual challenges for some technologies: 1) the future share of nuclear is unsure (notably due to the event in Fukushima); 2) the development of CCS technology is subject to delay; 3) the integration of renewable energy sources into existing power structure is challenging (both technically and economically, as it implies substantial upfront investment). Russia has the potential to become a very important market for these new/alternative technologies, but there is an urgent need for Russia and the region to eliminate gas subsidies, give proper price signals for gas and electricity, and improve the market design to attract international companies.

To enhance energy efficiency and accelerate decarbonisation of the power sector, the Russian Federation has recently created a series of national energy technology platforms with the aim to involve all relevant national stakeholders, from Government to private sector. Their structures are still being developed and further funding is being sought. The IEA believes these platforms benefit from involvement of international expertise from the public and private sectors. The IEA- Implementing Agreements are a relevant tool in this respect.

Summary of the second day discussions

The second day was organized to stimulate the debate in four key topic areas in roundtables discussions on: (1) modernising thermal power plants; (2) distributed energy systems (incl. the integration of renewables and CHP); (3) smart grids development and deployment; and (4) energy efficiency in building and industry.

(1) Modernising thermal power plants

Thermal generation will continue to be the main source of electricity generation in Russia the coming decades, and nuclear energy will continue at the current level in Russia. A wide deployment of renewables is not yet foreseen but some local applications will be developed. Thus, thermal generation - i.e. gas and coal- will be the backbone of Russian power system for many years.

Most of Russia coal fired plants are old and energy intensive, so much need to be done to modernise existing infrastructure and build new plants. This modernisation process opens a significant opportunity

for domestic industry development, which was mainly highlighted during the presentations. Important efforts are being implemented in support of developing industry to supply the heavy equipment needed for the construction of new plants. It is important to underline that the necessary technologies are already available in the international market, e.g. for gas the Gas Turbine Combined Cycle and for coal, Ultrasupercritical plants. Also, for the IEA, the challenge for Russia is more linked to the need for improved regulatory frameworks rather than to technological development. While some speakers remarked the business atmosphere has improved since the monopoly energy structure ended, others highlighted that that low tariffs impeded sufficient returns of investment.

Some presentations dealt with the experience in construction of 660 MWt supercritical power and the different options for plant configuration, EM - Alliance developments in boilers design and manufacturing, Alstom strategies in Russia or GE focus on coal gassification as flexible supply of chemicals or power.

Lesley Sloss, from IEA Clean Coal Centre, provided an overview of European legislation impacts on coal plant emissions, in particular with reference to the following Directives: Integrated Pollution Prevention and Control (IPPC) vs Large Combustion Plants Directive (LCPD), and the challenge that the resulting Industrial Emissions Directive (IED) means for the current coal-fired fleet in Europe. The IPPC and LCPD directives, which are soon to be superceded by the IED, overlapped but also disagreed with respect to the exact emissions limits that coal-fired plants were required to meet and what technologies might be required. This led to some confusion within the industry. The new IED clarifies the legislation and extends the deadlines by which plants must install new control technologies such as FGD and SCR. However, the IED is challenging and compliance will be expensive for those plants which do not already have FGD and SCR (or equivalent technologies) already installed. Many plants, especially those which are near or even beyond their expected maximum life-time, will opt-out of the IED and this will mean a significant reduction in coal-fired capacity in many countries within the EU. Without new coal or nuclear plants, the shortfall in energy capacity will have to be met with either renewable technologies or gas-fired plants.

The Russian Federation should coordinate any legislation to ensure that any emission limit values agree with what can be achieved by the best available technologies in a cost effective manner. They would greatly benefit from taking into account how any legislation will affect the continuation of operation of older plants, which are still required to meet baseload power requirements but which may be regarded as too old to merit significant retrofit investment. This links to the question of how many plants will close down if the legislation is considered too challenging.

The IEA believes that although any effort in R&D and technology development must be encouraged, the real challenge in Russia is to set a policy framework which enables the substitution of the entire stock, and remove all the barriers hampering to adopt modern technologies. The real challenge is not to develop more advanced technologies but to use the current state-of-the-art.

(2) Distributed energy systems

Russia has a lot of regional resources, such as biomass, geothermal and even some fossil fuels with uneven regional distribution, making distributed energy generation a logical solution. Discussions in the roundtable concentrated on several technical solutions for distributed electricity as well as heat generation, with a strong focus on biomass and geothermal (heat pumps) technologies. A strong tradition with concentrated heat and power and district heating allows for certain technologies (waste fuels, biomass and peat fuels) to be more feasible in the Russian context than others.

In Finland, for instance, the concentrated heat and power (CHP) and district heating (DH) have gained substantial economic and environmental benefits. In year 2009 only, the fuel savings of coal equivalent of 3 million tonnes were achieved, which is equivalent to 600 kg of coal and 1400 kg of CO_2 emissions per inhabitant avoided in one year compared to the alternative heat and power production modes. Therefore, in Finland, both CHP and DH have been major contributors to high energy efficiency and low emissions of energy production.

Distributed heat technologies such as heat pumps do not necessarily conflict with district heating systems though. Examples were shown where a building used a hybrid system of a ground source heat pump with the district heating system as a back-up for the winter period. Other examples exist of converting heat-only boilers in buildings into CHP boilers.

However, given the fact that the Russian energy system today is mainly based on centralised energy generation, some barriers and challenges need to be overcome in order to facilitate distributed energy generation. A legislative framework favouring distributed energy generation should be developed in order to accelerate that supports the development of distributed energy generation.

Discussions also insisted on the need for accelerating the development of new technologies in Russia to avoid dependence on imports. In this regards, Russia could beneficiate from international expertise by further participating in IEA Implementing Agreements. Russia as the largest DH and CHP country in the world could both largely benefit and contribute in terms of international research and development of distributed energy systems. Moreover, introducing competition in the heat market could facilitate the uptake of distributed heat generation.

(3) Smart grids development and deployment

The main drivers for the development of smart grids in Russia are twofold: first, problems and congestions in the transmission and distribution network have significant impact on the availability (e.g. functioning) of the system (interruptions) and on the quality of the power delivered. Most of these problems are linked to old equipment and limited system observability and automation. Secondly, the progressive change in the characteristics of the electricity user, evolving from an energy intensive heavy industrial load, towards an information intensive user requiring a higher level of power quality.

Apart from the obvious geographical conditions of Russia, with a very wide territory characterised by very different climatic conditions and concentrated loads often close to the primary energy sources, the

Russian energy situation is perceived as having limited concern from the governments about energy security problems. However smart energy systems are getting progressively higher in the focus of national investments and this is proven by the setting up of several Technology Platforms (among which the Smart Grids national technology platform and the interest in ISGAN).

The lead in the development and deployment of smart grids in Russia is taken by power companies (as well as T&D operators) and their research centres, as well as by academia. This implies that a strong focus is given on short and mid term approach for the electrical system development, taking into consideration the specific interests of the companies, with the risk of giving a limited importance to the interests of the final user.

The development and deployment of the Russian smart grids is seen as *an active/adaptative electricity system* characterised by a distributed intelligence able to take decisions with the main focus on *availability and power quality*.

The development of smart grids is driven by three aspects. First, *network observability*. This will be achieved by means of network monitoring and diagnostic systems (backed up by robust models) and through the development of tools and procedures for the system operation under transient and emergency conditions as well as for the system restoration after faults. Second: *automation and control*. The characteristics of the system imply a very strong attention to the frequency stability and control issues. This will be achieved through the use of wide area monitoring systems and the related ICT infrastructure. Finally: *advanced system management*. This will be possible through the use of power system technologies, such as FACTS (flexible AC transmission systems) and HVDC (high voltage direct current) technologies, as well as with the use of high temperature superconducting devices. Developments and studies are undertaken also in the field of RES integration, variability balancing through storage. Limited activity is still undertaken on electric vehicles integration and smart cities.

As in the rest of the world develops of smart grids will proceed through the setting up and operation of pilots and demonstrators. We can mention two demonstrators on transmission (one in the South-East regions and one in the North-West regions) and a demonstrator on islanded systems in the islands of Rusky and Popov, involving also the final user in a micro grids experiment. To be mentioned also the Skolkovo technological park where smart grids experiments are also conducted. Further developments of the smart grids experiments and deployment will need very deep changes in the regulatory environment.

Cost-benefits analysis for the development of specific projects in smart grids is in progress. The foreseen expenses for the development of significant portions of smart grids in Russia are estimated in 3000 billion Rubles by 2030 (not sure of the o.o.m). the international credit system is active and interested and is offering projects financing in the field of electric system development (large projects - > 10 M€ are financed up to 50% with 5-25 years loans - priorities are environment protection, efficiency and transport).

International cooperation is perceived as a key to success. Smart grids technologies are similar worldwide, but are parts of the puzzle that can give a specific Russian picture.

(4) Efficient use of energy in the end-use sector

Energy efficient is very important in all sectors and the awareness among different stakeholders group is slowing rising. Russia is moving forward on labeling and standards programmes for different equipments (although one participant indicate that more ground work is needed and that the market was not ready for the labeled of over 60 products – there is a need of step-by-step introduction). There are some successful projects with ESCOs even if the legal framework is not "user-friendly" for these companies. Russia is interested in efficient buildings. The technologies exist to improve energy efficiency.

There are still numerous barriers to overcome regarding energy efficiency. While technologies exit to improve energy efficiency, efforts should be made to have these technologies available within Russia. Right now, technologies are mainly being imported.

The quality of reported processes for efficiency and energy use data was highlighted as questionable– the way the data are analysed and reported convey a potentially incorrect representation of the real situation (one participant indicated that the electricity losses were not calculated using "international standards" but were calculated so that Russia shows minimum losses even though electricity theft and distribution losses are imprtant). The right mechanism (financing, politic, economic, etc) should be put in place ("avoid corruption").

In terms of financing energy efficient upgrades, new business models and financial instruments will be required. For industry, the pay-back period required on such investments is longer than that normally accepted (up to 7 to 10 years)). Some interesting cost-sharing business models were however presented, which helps to overcome some of these up front capital investment and slow pay-back challenges. There is a pressing need to raise awareness of the benefits of such opportunities for all stakeholders.

Some recommendations can be made. Russia can learn a lot from different initiatives around the world but one solution may not fit all. Each country has its own specificities that need to be dealt with. A major focus should be on trying to create a favorable environment, politically and economically, to ensure maximum uptake of energy efficiency. Improved data gathering and perform analysis – based on international practice – should be done to provide a good basis for decision making. Russia should approach energy efficiency in a holistic way and set legal framework to enhance the up-take of energy efficiency.

Concluding remarks on the Conference

Given Russia great potential for energy efficiency savings in power generation, the creation of the Russian energy technology platforms is a very positive development, and the IEA is delighted to see the keen commitment of all relevant national stakeholders, from government and the private sector, in

these networks to accelerate the country efforts. These Platforms are in their initial phases, therefore- this Conference aimed to share national, regional and international expertise useful for the implementation their work programme. The IEA Technology Platform would be pleased to continue to support these national Platforms, including by creating relevant links with international initiatives and support their work programme. This collaborative effort will be valuable for the global community to better understand the realities in Russia, and we also believe valuable for Russia to build on the work undertaken around the world.

Transition towards more efficient power generation has to be managed carefully, including through market reforms and enhance quality of data. The IEA-Technology Platform has a convening power and hence can be a very useful tool in this respect. To date, Russia has made very good and substantive contributions to IEA-Technology Platform and the IEA wish for your continued participations to IEA TP events.

This Conference has seen a very broad participation from the IEA, international companies, national companies and other institutions. The most important issue is the development of energy efficiency in this country, and beyond, in the region.

Next steps

This Conference indented to be the first for an enhanced collaboration between the IEA and the Russian Federation through the IEA-Technology Platform. Follow up activities have been suggested and are currently discussed further with the Ministry of Education and Science, the Kurchatov Institute as well as with Inter RAO UES.

These propositions include: (a) further involvement of the Russian Federation in relevant IEA-Implementing Agreements (related to energy efficiency, renewables and electricity –Russia's definitive accession to ISGAN should be confirmed soon); (b) organisation of technology specific workshops in collaboration with the relevant Russian technology platforms; (c) as a result of these workshops, support for the development of national/technology specific roadmaps in support of Russian energy technology platforms' work programme.

Such enhanced collaboration could be included in the programme of work of the MoU recently signed between the IEA and the Ministry of Education and Science of the Russian Federation.

Discussions are currently ongoing about organising a workshop in April 2012 in collaboration between the Technology Platform and the Russian Platform for Bioenergy to support Russia efforts for the development of a national roadmap.

On energy efficiency in particular, the Russian energy agency (REA) is interested in sharing experience and lessons learned on the implementation of building energy codes and energy labels as well as economic instruments used to make energy efficiency happen in IEA member countries. The REA is currently collecting data and information on the existing instruments in Russia and the challenges faced in their implementation. The REA will kindly provide this information to the IEA as a core input to IEA

analysis on current policies in Russia that will lead to policy recommendations. The IEA-Sustainable Building Centre will deliver to REA a country profile report on buildings that will include policy analysis and, if possible building, stock data analysis.

The REA is also interested in organising of a workshop on energy efficiency policies in buildings in collaboration with the IEA Sustainable Building Centre (SBC), probably in spring 2012. The IEA has also proposed to work with the Russian Energy Agency on the estimation of saving potentials in the building sector by implementing energy efficiency policies. The REA expressed its interest on this project, notably to learn more about IEA methodology. However, as data needed for modeling are currently not available in Russia, the IEA will provide guidance to design proper data collection.