POWER&PERFORMANCE

Y2K CHALLENGES FOR ELECTRICITY GRIDS IN EASTERN EUROPE

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More than 400 nuclear power plants are operating around the world. Authorities in most countries and regions are conducting intensive diagnostic and corrective activities to "find and fix" Y2K problems in their nuclear power plants. In some countries and regions, comparable efforts have not been implemented, and efforts have focused mainly on contingency planning and preparedness.

The situation underscores the importance of pooling experience globally, since results of diagnostic and corrective activities can be of benefit to all countries. In particular, activities on "find and fix" Y2K problems in electricity grid control systems and computer related technology in national and regional dispatch centers are valuable because of the widespread use of the same components, equipment, and software.

In general, the Y2K problem can directly affect the safety of nuclear power plants through interfaces with the electric power and telecommunications systems. One major specific concern is that the Y2K problem can influence stability of electricity grid performance, thus creating an increase in the probability of tripping of nuclear units or loss of off-site power. In recent years, probabilistic safety assessments of the United States Nuclear Regulatory Commission (NRC) have made it clear that a "station blackout" at a nuclear power station is a major contributor to the sequence of events that could cause a severe accident. Station blackout refers to an event in which a loss of off-site power is coupled with the inability of the onsite emergency power supply, e.g., diesel generators, to provide vital power to plant safety equipment.

To foster greater exchange of information and experience, the IAEA organized an experts meeting in late 1998 to collect information on Y2K activities related to grid operation in countries that operate nuclear power plants and to identify specific actions and issues related to grid disturbances. The particular focus was on countries in Eastern Europe, where there were delays in taking Y2K corrective actions and electricity grid systems are similar in terms of components, design, and operation. Most of these countries either operate their own nuclear power plant or are linked through their electricity grid interconnections to a neighboring country that operates nuclear power plants. Experts from three countries - Bulgaria, Russia, and Slovakia - presented reports on their electric power systems. This article highlights aspects of these reports.

All three countries have initiated actions to prepare for the Y2K problems in their electric power systems. The extent of testing accomplished and status of planned actions varies.

Bulgaria. Bulgaria has set up a special council of experts for the power sector and initiated actions to respond to the Y2K problem in accordance with an order from the President of the Committee of Energy. Actions required include an inventory of the information and management systems of all elements. By the beginning of 1999, seventy-two of these organizations (from a total of 74 companies and 30 branches) had completed estimates of the problems and funds required to address them.

The considerations involved in planning and implementing activities for coping with the

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Y2K problem included examination of internal and external interfaces, clarification of supplier related issues, preparing scenarios for critical systems, and for new orders requiring supplier warrantees related to Y2K compliance.

The control systems within the power plants are being evaluated. In the Bulgarian Power System, there are 14 nuclear and other thermal units and 26 hydroelectric plants that can be involved in direct load frequency control from National Dispatching Center. The reactor control systems of these electric power units had different suppliers.

The new supervisory control and data acquisition system at the Bulgarian National Control Center was scheduled to be in regular operation April 1999. The hardware, operating system, and application software are Y2K ready. Additionally, the telecommunications equipment installed in power plants, substations and control centers is Y2K ready. The systems at the Regional Dispatching Centers and at the control center for the city of Sofia are also being upgraded for reasons related to the Y2K problem. These upgrades were scheduled for completion by September 1999.

Following preliminary analyses, Y2K simulation tests were conducted over the past year. These tests of the Bulgarian Power System were completed in October 1998. All systems operated normally, except for problems with archive searches for the time period 1999 and 2000. Additional activities are planned, including those related to telecommunications. The general conclusion of Bulgarian authorities is that the problem is under control.

Russian Federation. The management of Russia's Integrated Power System (IPS) is performed by dispatching centers which are organized into a hierarchic system of dispatching management and control that has four levels. The Central Dispatch Board is at the top of this system and includes seven territorial dispatching boards, as well as dispatch to, and coordination of activities and data exchange with, dispatch centers in Ukraine, Belarus, Moldavia, the Baltic Association, the Transcaucasian Association, and Kazakhstan. Under the regional dispatch boards, there are 72 regional power systems and hundreds of local power distribution grids

The IPS's seven territorial power systems are for Northwest Russia, Central Russia, the North Caucasus, the Middle Volga, the Urals, Siberia, and the Far East. The IPS's regional power systems are interconnected through a transmission network covering about 5000 miles from east to west through six time zones.

The Russian IPS has an extremely robust grid; the operational methods that sometimes require load and generation shedding are used to preserve the overall integrity of the grid. Many severe challenges have been met over the past 50 years without loss of the grid. The operational priority is to protect the grid, accepting the local blackouts that result from manual or automatic disconnections.

All of the dispatch boards use similar equipment, with similar functions. While originally they had standard software and equipment, there have now been three or four modernizations. The current situation is that several different systems are in use. Thus the sensitivity to the Y2K problem differs from region to region in Russia and with different interconnections outside of Russia. It is anticipated that the more modern equipment sensitive to the Y2K problem can be fixed relatively easy. The older systems that have outdated hardware and software will require considerable effort to fix. Telemetry equipment in power plants and transformer substations that provide data and information to the relevant dispatch centers have no Y2K sensitive equipment.

Actions are being taken by two Russian Ministries to respond to Y2K concerns. The Ministry of Electricity is addressing the transmission and distribution system. The Ministry of Atomic Energy (Minatom), directly and through Rosenergoatom, is addressing concerns at nuclear units. Activities are being coordinated both at the working level and the ministerial level.

An executive order addressing the Y2K problem was issued by the government of the Russian Federation in June 1998. The State Committee for Communications and Information Support was named the lead organization for Y2K actions. This State Committee formulated and issued methodological

JOINING FORCES

The bug's potential impact on electric power networks connected to nuclear power plants is a prime focus of global cooperation. More than 80 participants from 20 countries met earlier this year to reinforce their joint efforts for strengthening Y2K preparedness and contingency planning. The venue was an International Workshop on the Impact of the Year 2000 Problem on the Nuclear Industry organized in Ottawa, Canada, in February 1999 by the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD). It was hosted by Canada's Atomic Energy Control Board.

Experts at the meeting emphasized the need to move contingency planning to the forefront of Y2K strategies, and to focus on external risks to the electrical grid and communications systems, especially in countries lagging in areas of Y2K readiness. Planned cooperative steps included a global exercize designed to coordinate planning and communication and response systems relevant to nuclear power plants. The NEA is also working with a group of national coordinators and the IAEA to help keep countries informed of Y2K countermeasures and to set up contingency plans. The IAEA has issued step-by-step guides for contingency planning and other actions in its technical document, *Achieving Year 2000 Readiness: Basic Processes.*

In addressing the workshop, Mrs. Shirley Jackson, who chairs the US Nuclear Regulatory Commission, underlined the global dimensions: "We have come to recognize that nuclear power plants are not islands," she said. "The plants rely upon stable electrical distribution systems to support steady-state operations. Symbiotically, stable distribution systems rely on the collective output of generating facilities."

Countries participating in the workshop included France, Canada, the United States, the United Kingdom, Spain, Russian Federation, Ukraine, Japan, Finland, Germany, Republic of Korea, and Sweden. A full report on the meeting, including links to papers that were presented, is accessible over the NEA's Internet site at www.nea.fr.

guidelines to resolve the Y2K problem.

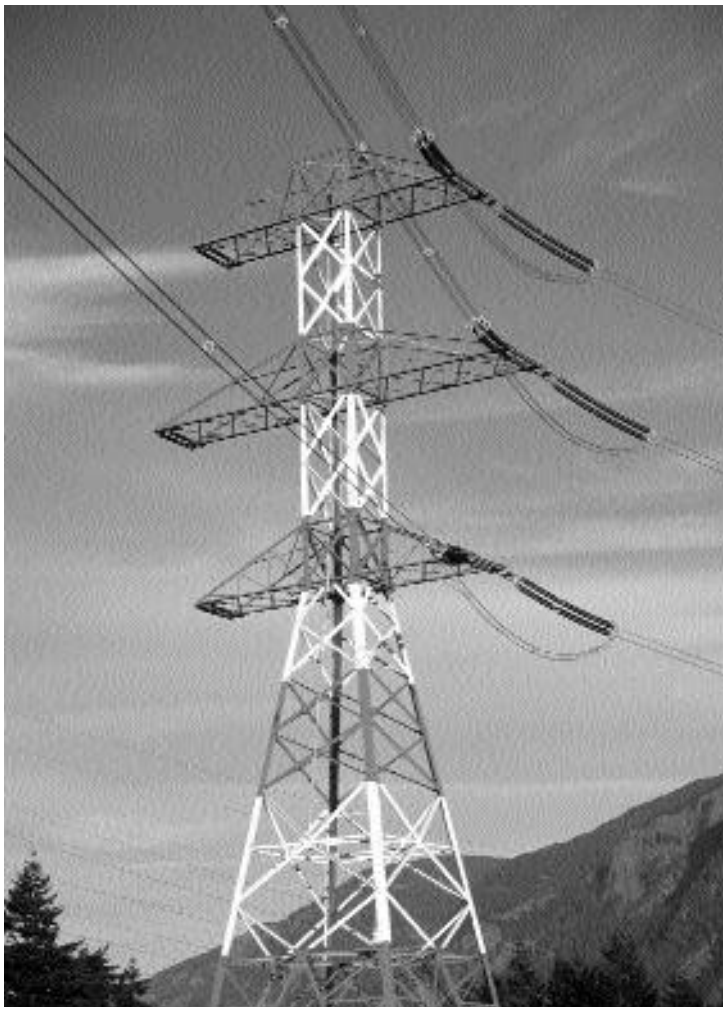
The IPS's Central Control Board has provided methodological guidelines to resolve the Y2K problem to all territorial and regional dispatching centers. This requires performing an inventory of all computer hardware and software in use to get precise data on the scale of the Y2K problem in the various level of the IPS dispatch system hierarchy. A requirement is to obtain information identifying which computers and software should be replaced, and which software should be modified. This task is facilitated by use of information from Internet sites and through contacts with hardware and software suppliers.

During the first quarter of 1999, a report was provided to the Russian Parliament (Duma) and all other authorities.

It is hoped that additional financial resources will be allocated in order to obtain specialized hardware. The current Russian economic situation and the economic situation in the Russian power industry makes it practically impossible to obtain the funding required to replace hardware and upgrade software. Thus, the IPS is focusing on upgrading efforts on the most critical systems and applications where failure or malfunction may have severe consequences. In addition to the upgrading of these top priority systems, an emergency preparedness plan is being done to cope with possible accidents, failures, and malfunctions.

At Minatom, an order required steps for analyses of all information and computer systems (including embedded software), and software to identify potential problems, develop required response measures, and report back to the Ministry. To implement the order, Rosenergoatom has recommended that all nuclear plant operators give high priority to Y2K actions.

These actions include identifying systems and equipment that might contain any type of computers and software; determining which of these are date dependent; assessing the importance of these system to safety; assessing theY2K readiness of these systems; establishing priorities; either correcting problems or providing feasible alternatives; and preparing relevant emergency work plans.



The majority of nuclear plants completed an interim inventory and reported results to Minatom and Rosenergoatom in November 1998. Rosenergoatom then prepared schedules to resolve Y2K problems, with work to be completed by September 1999. At that time all nuclear plants must provide written confirmations of readiness to Rosenergoatom.

Slovakia. The Information Technology Department of the Slovak National Electricity Company analyzed the Y2K problem and presented a report in May 1998. This report pointed out tha, at that time, the national electricity utility had not completed the necessary actions to fully address the Y2K issue. A programme was prepared and activities were initiated to aggressively identify all equipment with potential Y2K problems. These involved identification, testing, and remediation and readiness for auditing. The head office is responsible for coordination and taking action if something is not on schedule.

Based upon the IAEA's Y2K guidance, a revised approach was prepared to have equipment ready for audit, whether date sensitive or not. The Bohunice Nuclear Power Plant has inventoried all computer system software and has initiated a number of activities. The plant is connected to the West European system, which has good grid stability and control, so no problems are expected in this area. The reactor protection systems for Unit-1 and Unit-2 are being replaced with systems developed when the Y2K problem was recognized.

FOLLOWING UP

Experts at the Agency's meeting suggested additional steps designed to more fully share the experience of countries related to grid instabilities, interfaces, and respective influences on nuclear plant operations. As Y2K issues take on added urgency, the Agency is assisting in these efforts to exchange information and experience, particularly with countries that are neighbours to or have connections with countries operating nuclear power plants.

Follow-up actions to the meeting include:

- facilitating information exchange on the status of activities concerning the Y2K problem among nuclear power plant operators and utilities, as well as operators of power grids, in IAEA Member States;
- convening a workshop devoted to discussions on the status and results of work for resolving the Y2K problem at nuclear power plants and interfaces with electric grids.

The workshop is being held in mid-September 1999 at IAEA headquarters in Vienna. ❑

Photo: A network of grids feeds electricity to many countries of Central and Eastern Europe.