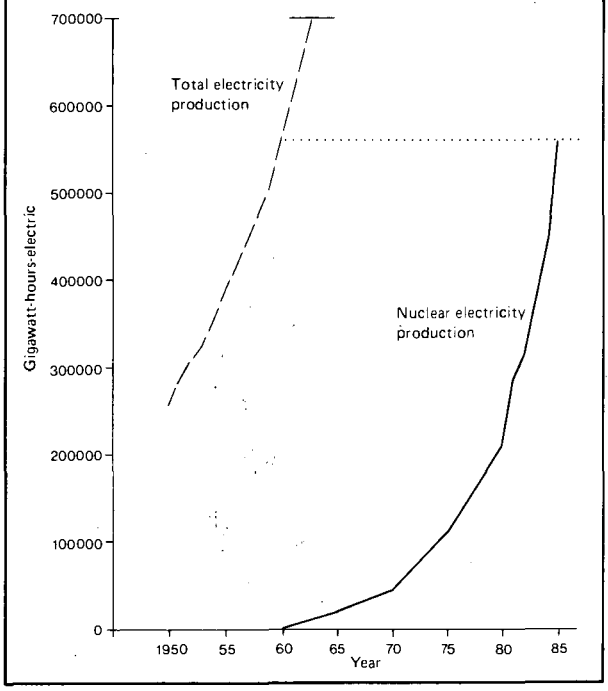
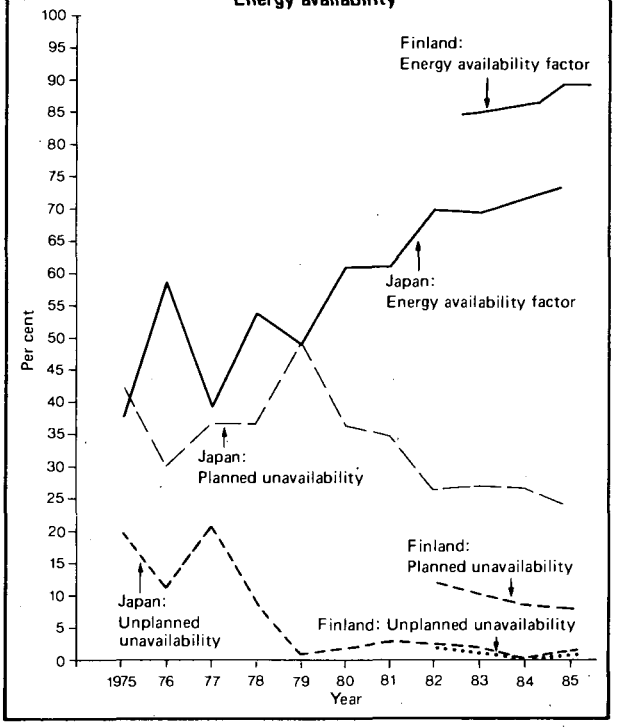
# International data file

**Further data from IAEA's Power Reactor Information System (PRIS) are published in *Nuclear Power Reactors in the World* (April 1986 edition), available from the Division of Publications, A-1400 Vienna, Austria.**

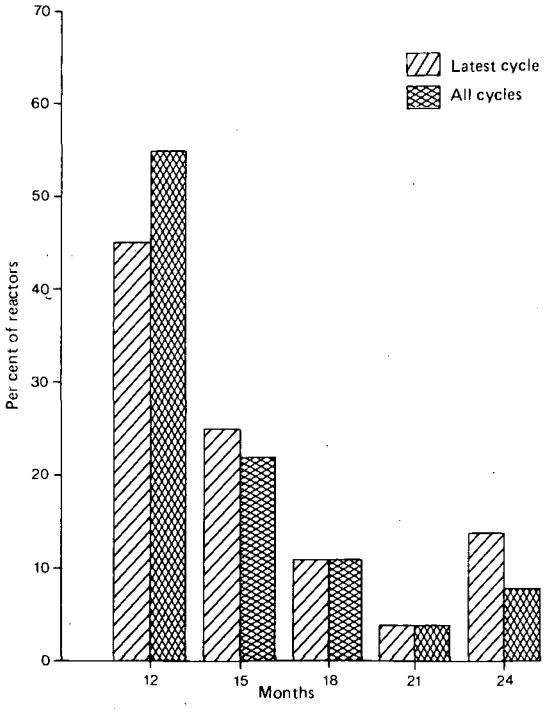
**Comparison of nuclear and total electricity production in OECD countries in Europe, 1950–1985**




**Energy availability**

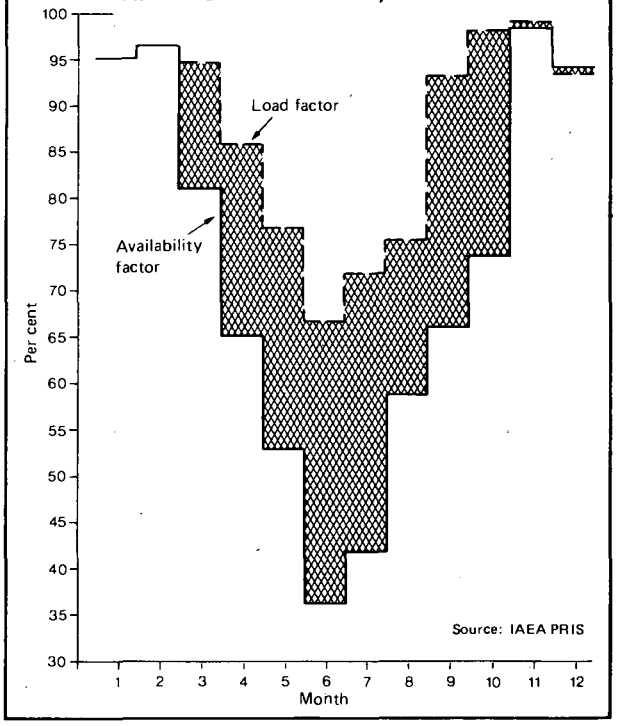



**Duty cycle lengths of operating light-water reactors**




Note: The first duty cycle is excluded. Data are for light-water reactors operating in 1984. Duty cycle is defined as the period from the start-up after a planned refuelling and maintenance outage up to the end of the next such shutdown.

**Sweden: Load and availability factors 1985**



# PRIS: A multi-purpose information tool

**by David White**

The IAEA has been collecting operating experience information about nuclear power plants in its Member States since the late 1960s. Data are provided in response to annual questionnaires sent to Member States either through official government channels or through designated national correspondents, usually in the operating organizations.

Response to the questionnaires has been generally good. Only two Member States have not furnished information. By the end of 1985, a total of 3825 reactor years of experience had been accumulated in the world, and 3080 of these have been recorded by the IAEA.

Data are used to prepare the annual IAEA publications, *Nuclear power reactors in the world*, which lists reactors with their status and basic design details, and *Operating experience with nuclear power stations*, which outlines the operating experience for the year for each power station. An operating experience analytical report is also produced annually.

In 1980 it was decided to create a computerized system to record all data and thus the Power Reactor Information System (PRIS) was born. It was soon found that PRIS could be used not just for producing publications, but also as a tool for performance analyses of nuclear power stations.

In 1984 the IAEA received some 40 to 50 requests for special data sets or reports from contributing Member States and PRIS has also been extensively used within the Agency. Results of some of its uses are shown here and are regularly featured through the *IAEA Bulletin*'s *International data file*.

Classically, the "load factor" (also known as capacity factor) has been used as one primary indicator of power plant performance. PRIS has been, and still can be, used to analyse load factor trends in a number of ways.

However, with the increasing proportion of installed nuclear capacity in several countries, "load-cycling" and "load-following" modes (basically operating modes that respond to fluctuating electricity demands) have become necessary. This has led the IAEA to change the basis of its performance analysis from load factor to "energy availability factor", which reflects the plant's availability to produce energy to the grid.

In Sweden and France, in particular, load-following has resulted in availability factors that are now some 5% higher than load factors. This also occurs in Finland, Argentina, and recently even to some reactors in the United States.

PRIS has been used in studies to examine cases of consistent high availability and also cases of improved availability. A good example of the latter is Japan, which has registered an improvement in reactor availability over the period 1977—85, as an accompanying figure shows. This large improvement has been achieved mainly by a sharp reduction in the unplanned energy loss as well a reduction in planned energy loss. Regulatory requirements in Japan necessitate a long annual planned shutdown, and there is not much opportunity of reducing this. Instead, the Japanese have concentrated on drastically reducing the unplanned unavailability.

Another example is Finland, where from 1982—85 there has been a consistently high availability which nevertheless is improving, mainly by reducing the period of planned unavailability (see related article in this issue).

Analysis of reactor performance as a function of age has revealed a somewhat puzzling lack of a maturity factor. It has been discovered that one of the factors causing a disturbance to the results was that reactors in general do not necessarily operate on an annual cycle. In fact, 55% of the light-water reactors in operation in 1984 were operating on 15, 18 or 25 month cycles.

PRIS now includes the capability for performance analyses on a duty cycle basis. While this is perhaps still somewhat in the experimental stage, it is helping considerably to throw light on the performance of plants operating with extended duty cycles.

Outage records have been collected for all reactors since 1971. In June 1986, with most of the data for 1985 collected, PRIS contained over 20 500 outage records.

Each outage is given a cause code according to a classification scheme developed jointly by the IAEA, the Union of Producers and Distributors of Electrical Energy (UNIPEDE), and the Commission of the European Communities (CEC). Equipment failure outages are further assigned a system code which identifies the major system in which the failure occured. Only the major system is identified, since PRIS is not a component reliability information system. A short description of the outage is also recorded.

In addition to the system and cause codes, each outage record contains data identifying the date of the outage, the duration, the energy lost, and an indication as to whether the outage was full or partial. Unplanned outages are divided into those arising from unplanned causes inside the station and those arising from external causes (such as grid failure).

Analysis of the outages has been performed for a number of years, but this is an area where a substantial amount of work and opportunities remain for the future.

PRIS also is used as the source of nuclear capacity and production values to the IAEA Energy and Economic Databank (EEDB). The EEDB contains annual statistics on a counting basis on a number of energy and electricity production parameters. PRIS and the EEDB often are used in conjunction with one another to produce, for example, analyses showing that in 1985 the European countries of the Organisation for Economic Co-operation and Development generated as much electricity from nuclear as they did from all sources in 1960.

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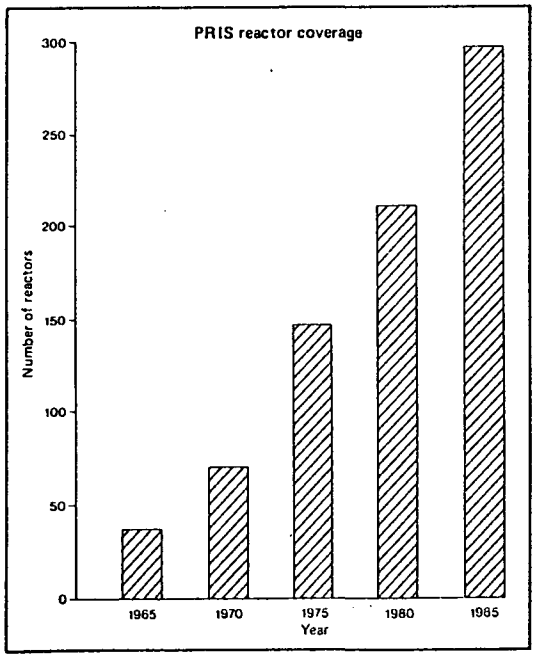


**Nuclear plant operating experience: Reactor years.**