



# ANNUAL REPORT 2006

**Nuclear Power Plants of ČEZ, a. s.**



**Taking into account the gradual changes of climate, the upcoming shortage of fossil fuels, and at the same time, the increasing demand for electricity, it is more than certain that nuclear power is about to experience a worldwide expanse and development. Despite all the care that is necessary to dedicate to promoting energy savings and renewable resources, nuclear power is the core source of energy capable of providing sufficient electricity for the near future.**



# INTRODUCTORY MESSAGE

## Looking back to 2006

By the end of 2006, the total number of six nuclear reactors at Temelín and Dukovany NPPs had successfully passed over 87 reactor-years of safe and reliable service. During their operation, they produced over 320 million MWh of electricity. As one may see, the Czech Republic has a long tradition in nuclear power generation on which it may build and grow, and with which to compare.

The plants at Dukovany and Temelín belong to an international fleet of ČEZ Group's power plants boasting the total of 27 power generation units in 15 European locations. The highest number of ČEZ's power plants is located in the Northern Bohemia, where they are fuelled by the local supplies of brown coal. Others are in Poříčí and Chvaletice in Eastern Bohemia, or in Mělník, Central Bohemia. In Moravia, the ČEZ Group operates the North Moravian plant in Dětmarovice and the South Moravian plant in Hodonín. Large hydro power plants on the Vltava river and the pumped-storage hydro power plants in Dalešice and Dlouhé Stráně mostly cover peak periods of production. In 2006, new members of the fleet were introduced – the Elcho and Skawina plants in Poland, and the Varna plant in Bulgaria. Thanks to the total installed capacity of 14,932 MW and the total yearly output of 65 million MWh of electricity, ČEZ ranks among the eight largest power companies in Europe.

In the Division Generation, the year 2006 was the year of implementation of the VISION 2008 project and of the integration of the generation base. It was also a year of big changes in the management of power plants and of preparation of key changes in the approach to operation, maintenance and renovation of our equipment. Implementation of these changes into the Asset Management system is planned in 2007. Apart of safe and reliable operation of our power plants, it was necessary to stabilise the operation of the Temelín NPP, and also to launch a restoration programme of brown coal-fuelled power base.

Key goals for nuclear power plants operated by the ČEZ Group were to finish the construction and to start operation of a second spent fuel storage at Dukovany NPP, to continue the modernisation programme of the I&C System at Dukovany NPP, to finish the selection procedure for a long-term fuel supplier for Temelín NPP, and to finish the approval process for the building parts of the Temelín NPP.

The year of 2006 was also a year of solving problems with nuclear fuel for Temelín NPP, and of never-ending discussions about the Temelín plant's safety with nuclear opponents. In order to operate nuclear power plants safely and reliably, it is necessary to ensure both perfect and reliable technology and experienced and skilled professionals to run it. In this area, we focused on the management, carrying out an audit of all top managers in the Division Generation.

In the framework of an international coopeation of nuclear power plants, we continue in active participation in activities and programmes of WANO, Foratom, and other worldwide and European organisations. Experts and managers from ČEZ nuclear power plants are much sought-after to international teams. At the end of 2006, the Temelín NPP has undergone an independent review by WANO, so called Peer Review Follow-up. The results show a very good standard of the power plant operation.

Latest analyses of the electricity demand in the Czech Republic show that we cannot get along without new power resources in near future. We feel responsibility for implemation of approved energy policy of the Czech Republic. This is why, in building new power sources, we will strive to make use of a full mix of power sources such as renewable resources, home-supplied brown coal, and nuclear units, which, together with the existing brown-coal power plants, will become the backbone of Czech power industry. Thus, we will be able to provide reliable, import-independent supply of electricity.

**Jiří Borovec**

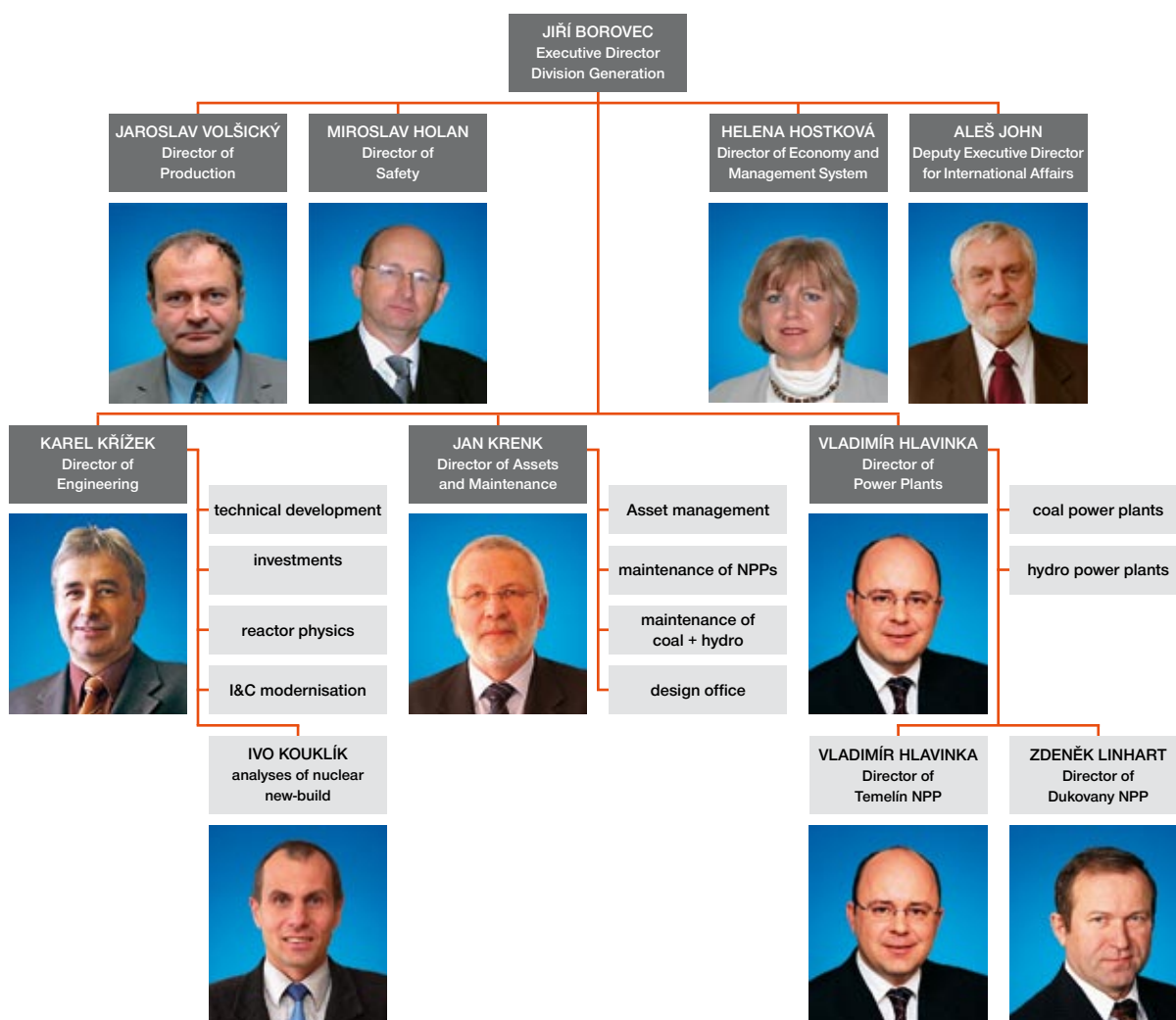
**First Deputy Chairman of the ČEZ Board, Executive Director  
of the Division Generation**



**JÍŘÍ BOROVEC**  
**FIRST DEPUTY CHAIRMAN OF**  
**THE ČEZ BOARD, EXECUTIVE**  
**DIRECTOR OF THE DIVISION**  
**GENERATION**

# ORGANISATION AND MANAGEMENT OF NUCLEAR POWER PLANTS

Both nuclear power plants Dukovany and Temelin fall under the Division Generation in the Power Plants Department. The management is a process-based oriented one with clearly defined system of reaching goals of the company, leading to fulfilling the expectations of our owners, customers and stakeholders.



The management system of the Division Generation is supported by a unified structure of documentation in the framework of the whole ČEZ Group. Sharing of information necessary for management and operation is carried out via an integrated system containing data from all appropriate organisation units.

Quality management of the Division Generation is customised in a differentiated way. On the highest level, there are activities related to operation of nuclear facilities and those activities which could lead to an ionising-radiation exposure. The fact that the quality management system fulfills the legal requirements of the Czech Republic was confirmed by the State Office of Nuclear Safety.



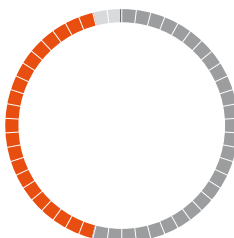
**Since July 2006, Mr. Vladimír Hlavinka is the Head of Power Plants,  
ČEZ, a. s.**

# NUCLEAR POWER GENERATION IN THE CZECH REPUBLIC AND IN THE ČEZ GROUP

Important characteristic of world power industry is a focus on increasing amount of power generated from emission-free resources. These resources do not emit harmful substances into the environment, such as namely oxides of carbon, sulphur and nitrogen. These include both renewable resources (such as hydro power plants, wind or solar-powered plants) and nuclear power plants. From the total amount of 62 million MWH produced by ČEZ in 2006, emission-free resources account for 28 million MWH, that is more than 46%. The most important emission-free resources operated by ČEZ are nuclear power plants, sharing 42% of the total. Apart from these, hydro power plants come next with the share of 3.6%, wind and solar-powered with 0.01% of the total production.

**Share of Emission-free Resources in the Total ČEZ Power Generation**  
(in percent)

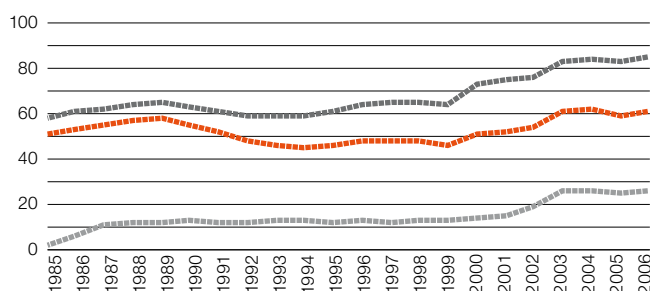
- emission-free nuclear
- emission-free hydro
- emission-free other renewables
- producing emission



In 2006, the total amount of 84,257,000 MWH was generated in the Czech Republic. 31% of this electricity was generated in the nuclear power plants Dukovany and Temelín. The total installed capacity of both nuclear power facilities is now 3,760 MW, that represents 21.5% share of the total installed capacity of the Czech Republic.

**Trend of Electricity Generation in the Czech Republic**  
(million MWH)

- CR
- ČEZ
- NPPs

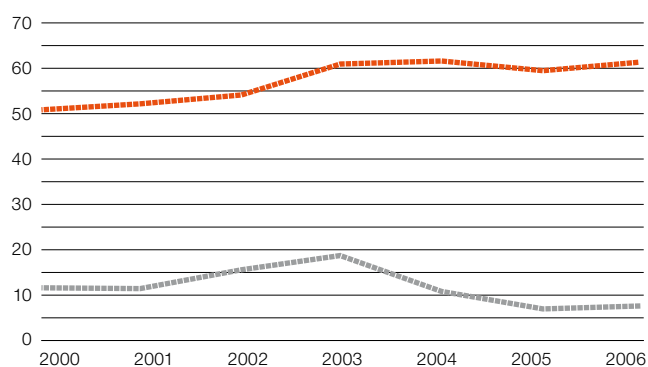


Although the total amount of electricity generated in the Czech Republic steadily grows since 1995, clear exports of ČEZ fall during last three years. This is mostly due to an increasing consumption of power in the country. In 2006, ČEZ exported about 7.5 mil. MWH, that was a 12% of its total generation.

### Trend of Electricity Generation and Clear Exports of ČEZ, a. s.

(million MWh)

- total electricity generation
- clear export



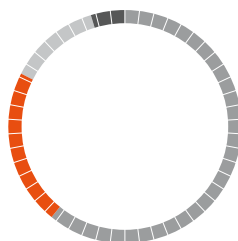
Based on estimates of investments in modernisation and reconstruction of power resources of ČEZ, the share of nuclear power in portfolio of ČEZ will steadily increase in the course of the following years. At the Dukovany NPP, over 10% increase of output is forecasted, thanks to the modernisation of technology and higher efficiency.

### Share of Installed Capacity and Power Generation in the Czech Republic in 2006

#### Installed Capacity

(in percent)

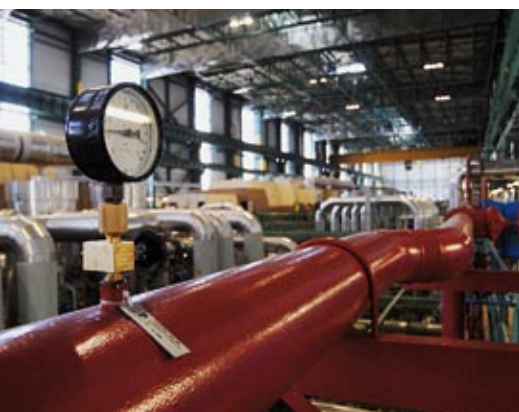
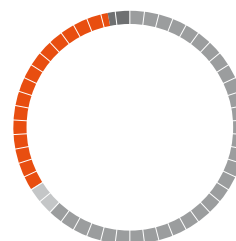
- coal 61
- nuclear 21
- hydro and renewables 13
- gas 5



#### Power Generation

(in percent)

- coal 62
- nuclear 31
- hydro and renewables 4
- gas 3







**The simulator of the main control room is waiting for students. Operating personnel is regularly trained to control the nuclear power plant in all situations.**



# DUKOVANY NUCLEAR POWER PLANT (EDU)

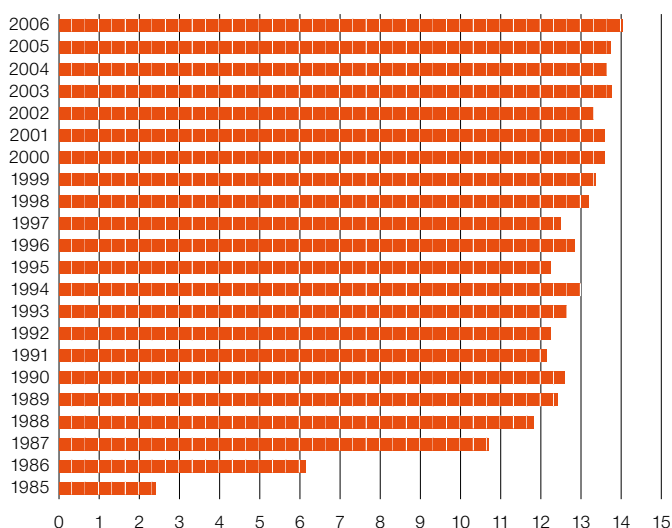
## Operation

In 2006, the yearly production of Dukovany NPP surpassed the mark of 14 million of MWH, for the first time in its history. Its four Units with the total capacity of 1,776 MW generated 14,025,421 MWH of electricity. The most important factor of the achievement was the increase of the output of the Unit 3 which was modernised in 2005. Another significant factor was shortening of maintenance outages in 2006. Last outage of Unit 4 was postponed to the end of 2006, stretching over into 2007 thanks to extensive maintenance works. The modernisation of low pressure parts of turbines on Units 3 and 4 has been carried out by the Czech company Škoda Power and ČEZ-ENERGOSERVIS. The supplier of the new I&C system is the Data Systems & Solutions company owned by Rolls-Royce. In the coming years the NPP capacity will steadily increase thanks to the planned modernisation, the power plant is expected to reach the capacity of 2,000 MWH in 2012.



ZDENĚK LINHART  
DIRECTOR OF  
DUKOVANY NUCLEAR  
POWER PLANT

**Power Generation at  
Dukovany NPP**  
(million MWH)



In twenty one years of operation the power plant generated nearly 266 million MWH of electricity, most of all the power plants operated by ČEZ. The operation of Dukovany NPP is safe and reliable.

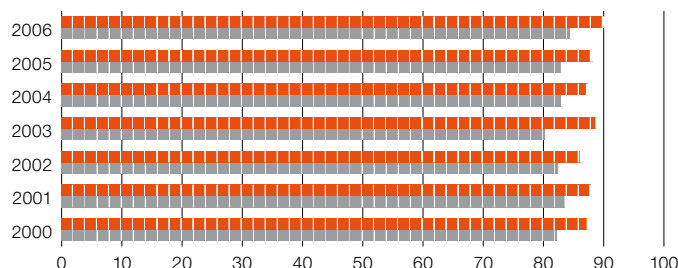
The measure of operation reliability is expressed by the indicator – **Unplanned Capability Loss Factor** which Dukovany NPP keeps at one of the lowest levels in the world. The value of zero percent, meaning that in the course of the whole year no losses occurred as a result of a technical fault of the Unit equipment, was achieved at Unit 3 in 2002 and at Unit 1 in 2005. The total value of the **Unplanned Capability Loss Factor** of Dukovany NPP in 2006 was 0.20% from achievable output.

Internationally, the operation capability of a plant is evaluated by the **Unit Capability Factor**. It is the share of real available generation to the maximum achievable power generation of the plant over a given period of time in percentage. In 2006, this indicator reached the value for all four Units of 90.2%. Compared to the worldwide average, the performance of Dukovany NPP exceeds it by 5.7%. This improvement is mainly thanks to cuts of the planned outages.

## Unit Capability Factor

(in percent)

■ Dukovany NPP  
■ world – average



In 2006, two rare events occurred in the European power transmission grid – so-called “island operation”, when the power grid was disconnected and power Units worked only in islands, isolated parts of the whole grid. In both cases, Dukovany’s Units regulated their output appropriately and significantly contributed to restoration of the desired balance between consumption and generation in the whole electrical grid.

All turbines operating at Dukovany NPP are certified to provide ancillary services in the regulation of power in the grid and are permanently connected to the automatic voltage regulation system. For the maximum efficiency of ČEZ’s resources usage, the Units of Dukovany are the last to be used for the regulation of real power, thanks to their low operation costs. Nevertheless, their use for regulation increases every year. In 2006, they operated in this regime for 771 hours.

## Safety

### A high level of nuclear safety is one of the top priorities of ČEZ, a.s.

All units operate in accordance with the requirements of the Technical Specifications and Limiting Conditions for the safe operation. Nuclear safety is significantly enhanced by the utilisation of in-house and external operating experience, as well as by development and updating of appropriate procedures for dealing with non-standard situations at the nuclear power plant. Thanks to these defined procedures, the staff is always ready to respond effectively in the event of technical anomalies and failures.

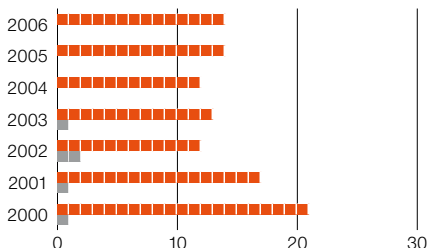
Within the Dukovany NPP, the system of operating experience feedback is consistently applied. One of the important measures for evaluation of efficiency of the system is the tracking of the number of safety-related events. Worldwide, safety-related events are classified according to the seven-degree international INES scale (International Nuclear Event Scale). The first degree (INES 1) covers events of the lowest safety relevance, which nevertheless constitute deviations from normal operation. Similarly to the preceding years, in 2006, events mostly below the first degree (INES 0) occurred at the Dukovany NPP. In the past three years, no incident of the INES 1 degree occurred at all.

### Incidents at Dukovany NPP

#### According to the INES Scale

(Number)

■ INES 0  
■ INES 1



Another important indicator of the level of plant safety and reliability is the **number of scrams** (unplanned, forced, immediate reactor shutdowns). Since 2000, not a single scram has occurred in any one of the four reactor Units.

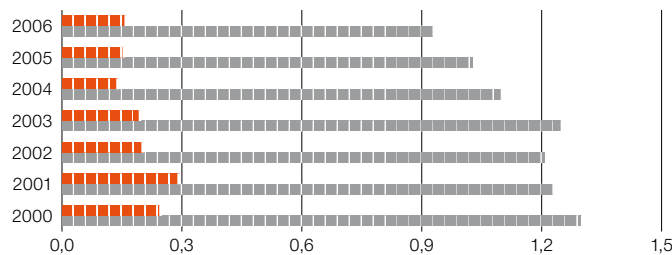
## Radiation Protection

The term “radiation protection” is defined as a system of technical and organisational measures designed to limit potential irradiation of individuals, and to protect the environment. The plant has consistently shown very good performance in protection against ionizing radiation.

A performance indicator of effectiveness of these technical and organisational measures is an indicator called **Collective Effective Dose (CED)**. CED represents the cumulative total irradiation of all workers who perform activities in the radiation controlled area. The lower the value of this indicator, the better the level of radiation protection, and thus the more effective the program of protection against ionizing radiation. In 2006, the Dukovany NPP achieved very low value of CED 0.15 Sv per Unit.

### Collective Effective Dose per One Reactor Unit (Sievert)

■ Dukovany NPP  
■ world – average



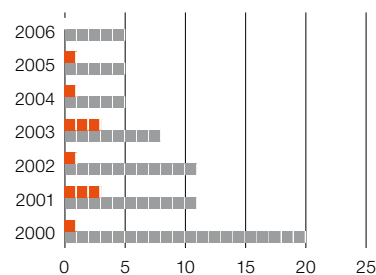
## Industrial Safety

Dukovany's performance in occupational health and safety has been excellent for years. In 2006, no work-related injury of an employee occurred, giving the best result in the history of the plant. Also, the plant was again voluntarily inspected in an independent audit by the regional Office of Occupational Health and Safety, denoting it as a Safe Enterprise. The audit confirmed good conditions at the plant, leading to improving occupational health and safety. The suppliers' results in this respect are also very good, with long-term improving trend. But, what is the most important, no serious work-related injury or illness occurred at the power plant for years.



### Industrial Safety Accidents at Dukovany NPP (Number)

■ suppliers  
■ employees





## Fire Protection

The high level of fire safety is demonstrated by the fact that in the course of the last six years the plant did not experience a single fire outbreak. The Fire Brigade unit, in the framework of the Integrated Emergency System of the Czech Republic, repeatedly exercised technical and fire-extinction interventions in the surroundings of the power plant.

## Maintenance

The equipment of Dukovany NPP is managed and maintained by the Assets and Maintenance Department documenting the required functions of the equipment and its compliance with design documentation. It also ensures technical and technological readiness, capacity, material and organisational preparation and implementation of all maintenance and repairs of the equipment. The process also includes coordination and control of maintenance activities carried out both during outages and during operation.

In 2006 all units of Dukovany NPP underwent scheduled outages. During these all activities planned in the framework of the maintenance, checks and inspection programs were accomplished. The total length of the outages for all four Units was cut by 3.4 days, compared to the length originally planned.

In addition to the regular maintenance and planned investments other important projects were carried out in 2006:

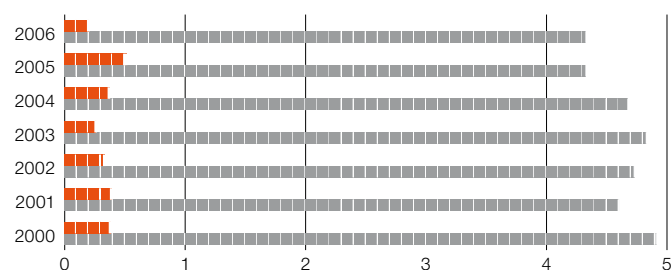
- replacement of separative parts of separators and steam re-heaters of the turbine system on Unit 4
- replacement of 6 kV switches
- repair of the cooling tower no. 3
- 10-year regular check of Diesel generators

One of basic performance indicators of maintenance effectivity is the **Unplanned Capacity Loss Factor**. It reflects the effectivity of the programs aimed at maintaining the system condition and reliability of the technology systems and equipment for safe and reliable generation of electricity. The following chart demonstrates extraordinary long-term results of the plant in this area.

### Unplanned Capacity Loss Factor

(in percent)

- Dukovany NPP
- world – average



## Engineering and Technological Development

In 2006 Dukovany NPP implemented several major investment projects that contributed to the modernisation of the plant and increased the efficiency of power generation.

- **Reconstruction of low-pressure flow parts of the steam turbines on Unit 4.**

New rotors with improved blades will cut the heat specific consumption of the turbine by at least 3.5%.

- **Replacement of main turbogenerator exciters on four Units** –increasing the reliability and operation efficiency of Units.

- **Reconstruction of the I&C system (M-module 1.2)** –represents the largest present investment project of Dukovany NPP. Works in 2006 followed the preparatory works carried out in 2005 following the schedule, both in full operation and during standard refuelling outages. Unit 3 underwent I&C modifications implicit in the parallel whole plant modernisation. Unit 2 had two divisions of new safety systems installed and the preparation of a new monitoring system continued. Unit 1 saw the trial simultaneous operation of new safety systems, and main parts of the Unit computer system were put into the full-operation mode. On Unit 4, preparatory works commenced simplifying and speeding up the installation of new equipment in future outages.

- **Reconstruction of the I&C system (M-module 3–5)** – The M3–M5 program forms an individual part of the complete I&C renewal plan. It covers the reconstruction of automatics and control circuits of the primary and secondary circuits, including the replacement of oil-based regulation of the turbine. The building plan was approved by the board of directors and project documentation was prepared for the selection process of the supplier; the selection process was opened. I&C functions classification was carried out from the viewpoint of nuclear safety, technological algorithms of management of the renewed equipment were laid down.

- **Using of design reserves of Units** – in May, 2006 a building plan was approved, which has an aim to increase effectiveness of using equipment and by this to achieve a total output of 2,000 MW. The general supplier of the project is the ŠKODA PRAHA, a.s., company. The implementation process will be done step-wise during a planned outages; first it will be launched at Unit 3 in February 2007, and last it will be finished at Unit 2 in 2012.

- **Spent fuel storage facility** was completed and opened on 16<sup>th</sup> October, 2006. The grand opening was visited by the president of the Czech Republic, by the chairwoman of the State Office for Nuclear Safety, and other important guests. Two new spent fuel containers Castor 440/84M were supplied in 2006.

- **Replacement of subsidiary essential power supply switchboards 0.4 kV** – for the supplying of crucial appliances. Implementation is gradual, carried out during planned outages. In 2006, the replacement was carried out on four systems, in 2007, this task will be completed on remaining two systems.

## International Cooperation

The Dukovany plant co-operates with a number of partner power plants abroad: in Slovakia (Bohunice, Mochovce), Finland (Loviisa), Hungary (Paks), Russia (Kola), France (Saint-Alban), and others. In 2006, several visits were exchanged. During these, useful information on the operation, management, organisation, IT systems and other matters was exchanged.



**Temelín NPP in full operation.**



# TEMELÍN NUCLEAR POWER PLANT (ETE)

## Operation

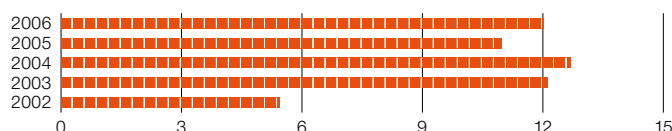
The two Units of the Temelín NPP with the installed capacity of  $2 \times 1,000$  MW are the largest and newest power generation plants operated by the ČEZ company. The first Unit entered a trial mode of operation in 2002, the second one a year later.

In 2006, the plant's generation accounted for a 19.4% share of the total production of the ČEZ company. The following chart demonstrates the generation of Temelín NPP between 2002 and 2006.



**VLADIMÍR HLAVINKA**  
DIRECTOR OF  
TEMELÍN NPP

**Power Generation at  
Temelín NPP**  
(million MWh)



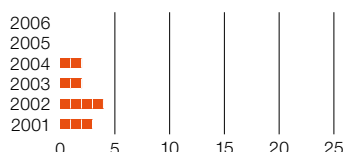
Apart from its main mission – supplying of clean electricity, which does not harm the environment with emissions of carbon dioxides, the power plant supplies heat to the nearby town of Týn nad Vltavou in the course of the whole year, and it also covers its own heating-wise needs.

In 2006, both power Units provided ancillary services in electrical grid – they regulated the required voltage level and reactive power in the pilot nodal point of the transmission grid to which the output of both Temelín Units is connected.

During the outage of Unit 2 at the beginning of 2006, the high- pressure turbine rotor was modified; this modification enabled the Unit to operate on 980 MW, after it was temporarily operated on reduced power in 2005.

In the course of the past two years no automatic reactor scram occurred at any of Temelín NPP's Units. This good result documents stabilisation of operation of both Units and their increasing operational reliability.

**The Number of Scrams**  
(for two Units)



## Safety

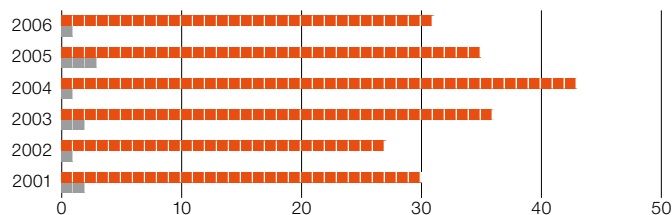
The top priority of Temelín NPP management is to ensure safe operation of the power plant. At all times, the power plant is operated in accordance with the Limitations and Conditions of Safe Operation.

Safety, reliability and efficiency of operation is enhanced by the utilisation of probability risk assessment. It stands mainly for the risk assessment in various technological system configurations during both standard operation and Unit outages. In such a way the operational safety of nuclear facility is all the time under good control.

In 2006, the power plant further stabilised the use of operating experience feedback programme. One of the main priorities of the programme is to use in-house and external experience of past events in preventing the occurrence of safety-related accidents. The efficiency of the operating experience feedback at the Temelín NPP is documented by the following overview of INES 0 and 1 incidents. The safety of the facility is, among other things, testified by the fact that in the whole history of the plant no incident more serious than INES 1 had ever occurred.

**Incidents at Temelín NPP  
According to the INES Scale**  
(Number)

■ INES 0  
■ INES 1

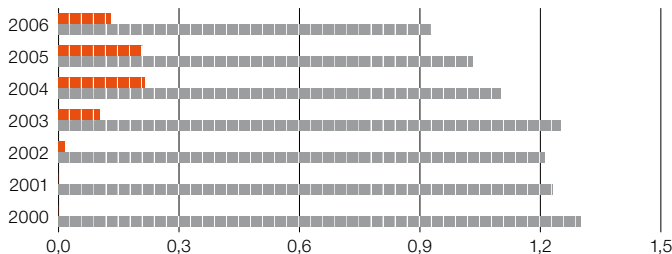


## Radiation Protection

During the second year of commercial operation of both Units of Temelín NPP, the levels of Collective Effective Doses (CED) were consistently low. In 2006, the total level of CED per Unit was 0,13 Sv, which documents the plant's outstanding results in maintaining radiation protection of workers who carry out activities in the radiation controlled area.

**Collective Effective Dose  
per Unit**  
(Sievert)

■ Temelín NPP  
■ world – average



Considering effluents from nuclear power plants into the surrounding environment, both Temelín and Dukovany power plants confirmed their minimum impact on the environment. The State Office for Nuclear Safety regularly reviews the amounts of effluents; for example, the gaseous effluents reached only tenths of percent of the authorised limit in 2006. Low values of this indicator in both locations confirm the minimum impact of nuclear power plants' operation on the environment and population.



## Industrial Safety

Temelín's performance in occupational health and safety has been very good for years.

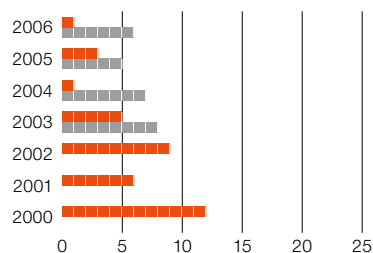
In 2006, the plant again underwent an independent audit "Safe Enterprise", conducted by the regional Office of Occupational Health and Safety. The audit confirmed a good trend towards increasing the occupational health and safety levels.

In 2006, only a single minor work-related injury of an employee occurred, and the suppliers' results in this respect are also very good. Apart from a few minor injuries of suppliers no serious work-related injury or illness occurred in the plant.



**Industrial Safety**  
**Accidents at Temelín NPP**  
(Number)

■ employees  
■ suppliers



## Fire Protection

The high level of fire safety is demonstrated by the fact that in the course of past four years the plant did not experience a single fire outbreak.

The Fire Brigade unit, in the framework of the Integrated Emergency System of the Czech Republic, repeatedly exercised technical and fire-extinction interventions in the surroundings of the power plant.

## Maintenance

In 2006, the main objective of the Assets and Maintenance Department at Temelín NPP was to further stabilise the power plant's operation, and to manage safely outages of both Units. Each year an outage of reactor Units is necessary to replace a part of spent fuel, to re-group the fuel in the reactor core, and to carry out all planned revisions, inspections and necessary repairs. These are carried out in accordance with the individual quality assurance programmes. Despite the fact that some previous technical problems were solved out during the operation period it was necessary to extend the planned refueling outages of both Units. On the other hand, thanks to a very good coordination of outages the whole-year stand time of Unit 1 was reduced. All maintenance, control and review activities were fulfilled according to the plan.

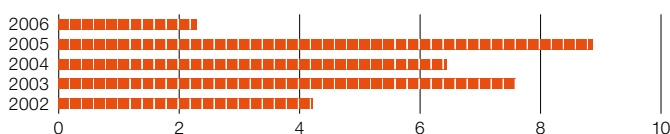




In 2006, the operation of both Units was significantly influenced by the unplanned outages mainly due to additional checks of the fuel. Together with experts from Westinghouse, the supplier of the fuel, we solved problems with fuel assemblies that needed more thorough and frequent checks. The controls resulted in modification of the fuel assembly VVANTAGE-6. The updated fuel will be supplied in the reactors of both Units in 2007.

We also successfully carried out a minor reconstruction of high-pressure parts of turbines at both Units. Nevertheless, the first Unit has to operate at a reduced capacity of 975 MW.

**Unplanned Capability Loss  
Factor of Temelín NPP**  
(in percent)



## Engineering and Technological Development

In 2006 a number of investment projects were carried out contributing to higher safety and reliability of the power generation at Temelín NPP:

- **Reconstruction of the high-pressure part of the turbine** – fourth stage was replaced. This increased the reliability of the H-P part of the turbine. At the same time, preparatory works for the modernisation of the whole H-P turbine system were carried out on both Units with the goal to increase the designed output and its reliability.
- **Complex replacement of power switchboard cabinets** for control of the linear inching drivers of the reactor control rods. The modification reduced the failure rate and it significantly improved the possible diagnosis of the equipment.
- **Replacement of nickel gaskets with camprofiles gaskets** – on the primary circuit components (the secondary flanges of the main cooling pumps). This measure reduced the strain and wear of gasket bolts, the gaskets may also be re-used.
- **Full-scope main control room simulator modernisation** – a contract for the software and hardware update has been concluded.
- **Dismantling of the building site facilities, landscape re-cultivation** – last stages of this work have been carried out, adapting around 2 km<sup>2</sup> of space of the former building site of the plant.
- **The final building completion approval for facilities of Temelín NPP** have been granted. The council of South Bohemia granted the approval, valid from 6<sup>th</sup> November, 2006.
- **The preparation of the spent fuel facility** – continued according to the schedule. A selection process for a supplier of containers has been finished.

## International Co-operation

Two Technical support missions have been organised in co-operation with WANO at Temelín NPP. At the end of the year, WANO Peer Review Follow-up was carried out confirming that the power plant fulfilled satisfactorily a number of recommendations given during the standard WANO Peer Review in 2004.

Temelín NPP has also increased its co-operation with two partner power plants abroad, with Cattenom NPP in France and Volgodonsk NPP in Russia. A series of visits took place, exchanging a number of useful information in areas such as e.g. radiological protection and the management of outages.

A VISIT OF INTERNATIONAL ASSOCIATION WIN (WOMEN IN NUCLEAR) AT TEMELÍN NPP



# EKONOMY

2006 was the first year when the Division Generation implemented a new economy management system with a clear goal to further improve the efficiency of all activities and to minimise costs.

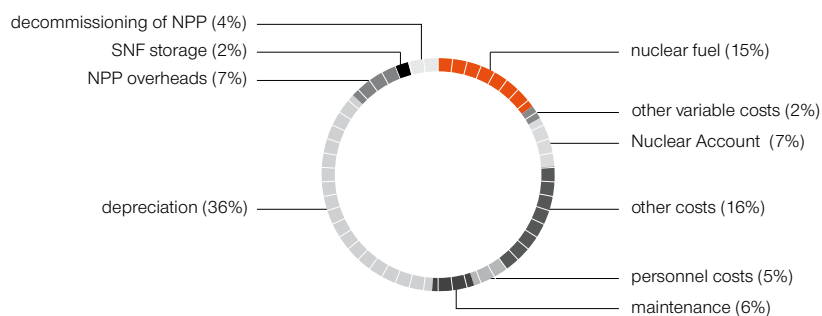
For 2006, sufficient resources for covering investment and operation costs of nuclear power plants were provided. Much attention was paid to efficient allocation of financial resources to the individual generation facilities and to regular controlling throughout the year. The operation and investment budget was observed, and both nuclear power plants gave very good economic results.

In October 2006, an international insurance pool of the plant's assurers and underwriters was carried out at the Dukovany NPP. Its good results confirmed that the shape of the equipment and its maintenance was very good, thus opening a chance of cutting the asset insurance costs.

The structure of the nuclear power generation cost in the Czech Republic is shown in the chart below. It covers all external costs such as the cost of spent fuel storage, the expenses connected with creating a decommissioning fund, and also so-called Nuclear Account, designated to cover the costs of management of radioactive material that was generated in the operation of nuclear power plants.

## Structure of Nuclear Power Generation Costs

(in percent)



NPP – Nuclear power plant

SNF – Spent nuclear fuel

## NUCLEAR FUEL

In 2006, the fuel of both Temelín and Dukovany NPPs was supplied as scheduled, in accordance with long-term contracts. Two transports of fuel from a U.S. supplier for the Temelín NPP and six transports from a Russian supplier for the Dukovany NPP took place. All transports were supervised by the State Office for Nuclear Safety.

As the nuclear fuel count for a significant portion of the total generation costs, a process of optimisation of refueling has been launched by the reactors' operator, and the supplier is in a process of new fuel assemblies development.

At present, the Dukovany NPP is finishing a process of transition to a five-year fuel cycle, as opposed to the initial design which expected a three-year cycle. This measure brings significant economic savings. The increase of the time period when the fuel remain in the reactor core means higher fuel burn-up that was changed from the original 30 MWd/kgU to 51 MWd/kgU. It has been reflected in upgraded construction of fuel assemblies (FA), particularly in the use of new materials in the construction elements, higher average enrichment of FA 4.25% U235, in the use of a burn-out absorber, and in the radial profile of the FA. The advanced fuel has been provided based on a contract with a Russian supplier, the licensing process was finished in 2006. Another important effect of this change is the dramatic drop in generation of spent fuel from the initial 114 FAs reduced to only 72 FAs. This results in significant safety benefit and cost savings in the final stages of the fuel cycle.

Because the contract with the fuel supplier for Temelín NPP is about to expire, a new selection process was opened. After complex analysis, a new supplier from Russia was selected. The power plant will be refueled with the new fuel in 2010.

In 2006, a new spent fuel storage facility was opened at the Dukovany NPP, whose capacity allows the operation of the NPP for further 40 years. The fuel will be stored in upgraded dry containers (type Castor). At the Temelín NPP, a building approval process has been launched to prepare the construction of a similar spent fuel storage.





## HUMAN RESOURCES

After a significant change in organisation in mid-2005, the 2006 was a year of stabilisation of activities of the Human Resources departments, and also the year of new directions in HR. The qualitative transformation of the human resources field logically resulted in the establishment of the Human Resources Division, and a new department with innovative approach, Training and Human Resources Development, emerged. This department caters for all the needs of employees in the areas of education and training. A number of HR activities directly supports and influences the work activities at nuclear power plants.

Managers of the Division Generation and other selected personnel entered a systematic education process, reflecting the findings of the manager development audit. This audit took place at the end of the preceding year and confirmed the high professional quality of managers at both nuclear power plants. In some cases results of the audit contributed to changes in managerial posts.



Nuclear power plants aim to attract new employees, particularly with university degrees, mainly for jobs of main control room operators and specialists. CEZ cooperates closely with technical colleges and universities. We participate, for example, in “Career Days and Job Market days”, addressing university students. Nuclear power plants also provided 26 thesis topics, offered to university students via the ČEZ website. Other activity aimed at encouraging the young talent is the Young Potentials one-year-long project, which aims to address young, motivated and talented prospective people.

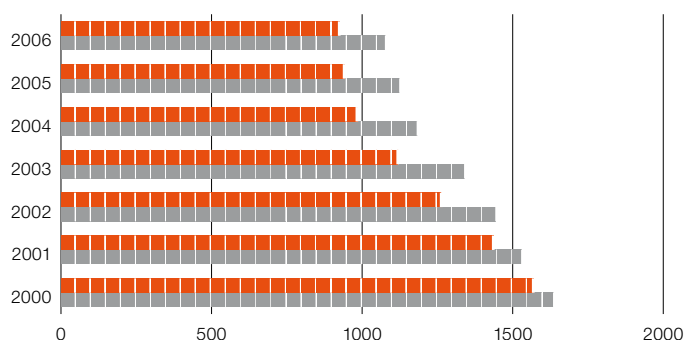
The staff of both nuclear power plants is trained in accordance with the pre-set procedures and time schedule. In 2006, the training was extended to cover the preparation for the WANO Peer Review carried out at the Temelín NPP.

The staff training field holds a significant achievement: the Human Resources award for the “Best Regional Employer”, awarded for the “Play Safe” project. This outdoor training program was launched in 2001, it has been focused on team building and on the communication of main control room staff.

### Number of Employees at Dukovany and Temelín NPPs

(number)

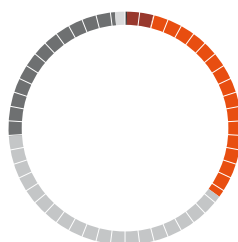
■ Temelín NPP  
■ Dukovany NPP



### Age Structure of Employees

(in percent)

■ up to 25 years of age (0 %)  
■ 26–30 years of age (4 %)  
■ 31–40 years of age (31 %)  
■ 41–50 years of age (39 %)  
■ 51–60 years of age (25 %)  
■ over 60 years of age (1 %)



# THE ENVIRONMENT

Nuclear power plants count among the most environment-considerate power generation resources. In their operation no greenhouse gases are produced, they do not consume oxygen or non-recoverable raw materials (oil, coal), which are important to be preserved for other purpose for future generations. The impact of nuclear power plants' operation on the environment is, compared to other widely used power resources, negligible.

The environmental policy of all power plants operated by ČEZ company is based on the principle of prevention and constant improvement of the environment protection. It covers the fulfilling of all legal requirements and standards and it outlines the goals the power plants should reach.

Since 2001, the Dukovany NPP has introduced and certified Environmental Management System (EMS), as required by the legal standard ČSN EN ISO 140001. In 2004, the EMS was re-certified by an audit for another three-year-long period. The Temelín NPP completed the implementation process of the EMS by a certification process in 2004.

In November 2006, both power plants again successfully passed a regular EMS audit. At its end, the Head Auditor of the international auditing body stated that both plants achieved a high level of environmental safety which forms a part of the corporate culture, an open approach, and a great strive towards the best most modern environmental protection.

Nuclear power plants pay maximum attention to the protection of environment. All legal standards are strictly implemented, and activities in connection with the protection of environment are closely supervised and evaluated. Research centers and universities participate in independent supervision and evaluation. Yearly evaluation reports are submitted to supervisory bodies, and are also available to broad public.

## Waste Management

In both power plants all radioactive waste products are treated with the utmost care. Waste is processed in accordance with legislative standards and recommendations of international bodies, and in a manner considerate to the environment.

All liquid waste is solidified via bitumenisation into 200-litre barrels and together with a portion of the solid waste it is deposited into a Radioactive Waste Storage Facility (URAO) at Dukovany, where it is safely separated from the environment.

Solid waste products which are free of radioactive contamination are a subject to certified measuring and subsequently, under strict control, they are released into the environment in a controlled way. Through a continuous improvement of technological processes, the production of radioactive waste from nuclear power plants is being gradually reduced.

The Radiactive Waste Storage Facility at Dukovany is in operation since 2002. Its capacity of 55,000 cubic meters is sufficient not only for the disposal of all the radioactive waste produced during the operation of the power plants, but it allows for the safe depositing of waste which will be produced as a result of the plant's decommissioning. At the end of 2006, 11 out of total number of 112 cells were filled up.





PROTECTION OF ENVIRONMENT IS ONE OF OUR TOP PRIORITIES

OPENING CEREMONIAL OF THE NEW SPENT FUEL STORAGE AT DUKOVANY ON 16<sup>TH</sup> OCTOBER, 2006





## PUBLIC RELATIONS

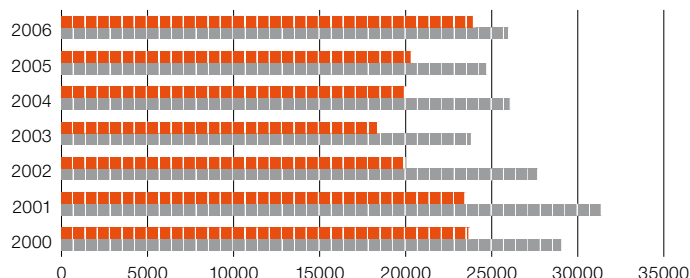
The public relations with the communities of both our nuclear power plants evolve successfully. Partnerships and cooperation were strengthened with regional representatives particularly in very good communication on all mutual matters and in support of a number of valuable projects. The ČEZ Group, the ČEZ Foundation and the Temelín NPP supported regional projects and activities with the amount of nearly 50 million CZK. In Dukovany region, this amount was even slightly more due to the finished construction of the spent fuel storage facility.

Both nuclear power plants focused on activities supporting cultural events and tourism development in the region. In Temelín area, the portfolio of supported events included an interesting and well organised project called "Orange Year in the Community" (orange is the colour of the company) that significantly contributed to the quality of life in the region. The total of 22 communities from the surroundings of the Temelín NPP participated in the project that supported nearly 500 various events of active cultural, sporting, and social life of the communities. Similarly in the Dukovany region, the ČEZ Group supported over 100 cultural, sporting and community events.

The information centres (IC) of both nuclear power plants are very popular among the general public. In 2006, the IC of Temelín NPP was visited by 24,000 visitors, 2,000 of them from abroad. The IC of Dukovany NPP has welcomed about 26,000 visitors (1,000 of them from abroad) and additional 11,500 visitors at the nearby hydro power plant Dalešice (both under supervision of IC Dukovany).

**Total Number of Visitors  
of the Temelín NPP and  
Dukovany NPP Information  
Centers**  
(number)

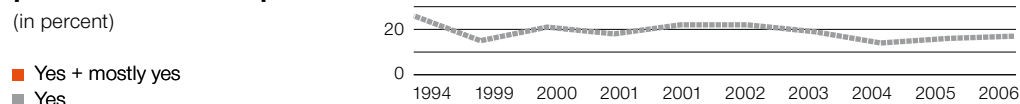
■ Temelín NPP  
■ Dukovany NPP



## Support of Nuclear Power in the Czech Republic

Figures from polls across the Czech Republic show that men support nuclear energy more often than women (65%, compared to 54%). Neither age, nor education influences this figure significantly. Much support of nuclear power is expressed by those who state that they have enough information about the operation of a nuclear power plant – 78%, compared to 37% of those who state they do not have enough of that information.

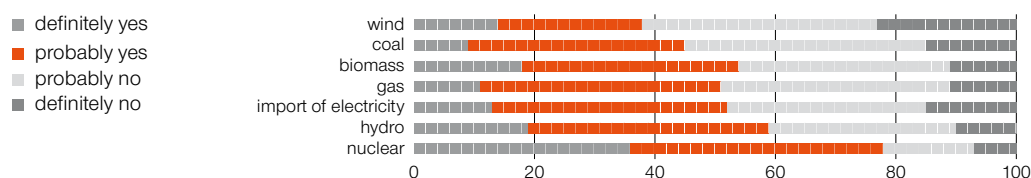
**Answers of Czech citizens to the following question:**  
**“Do you personally support the development of nuclear power in the Czech Republic?”**  
 (in percent)

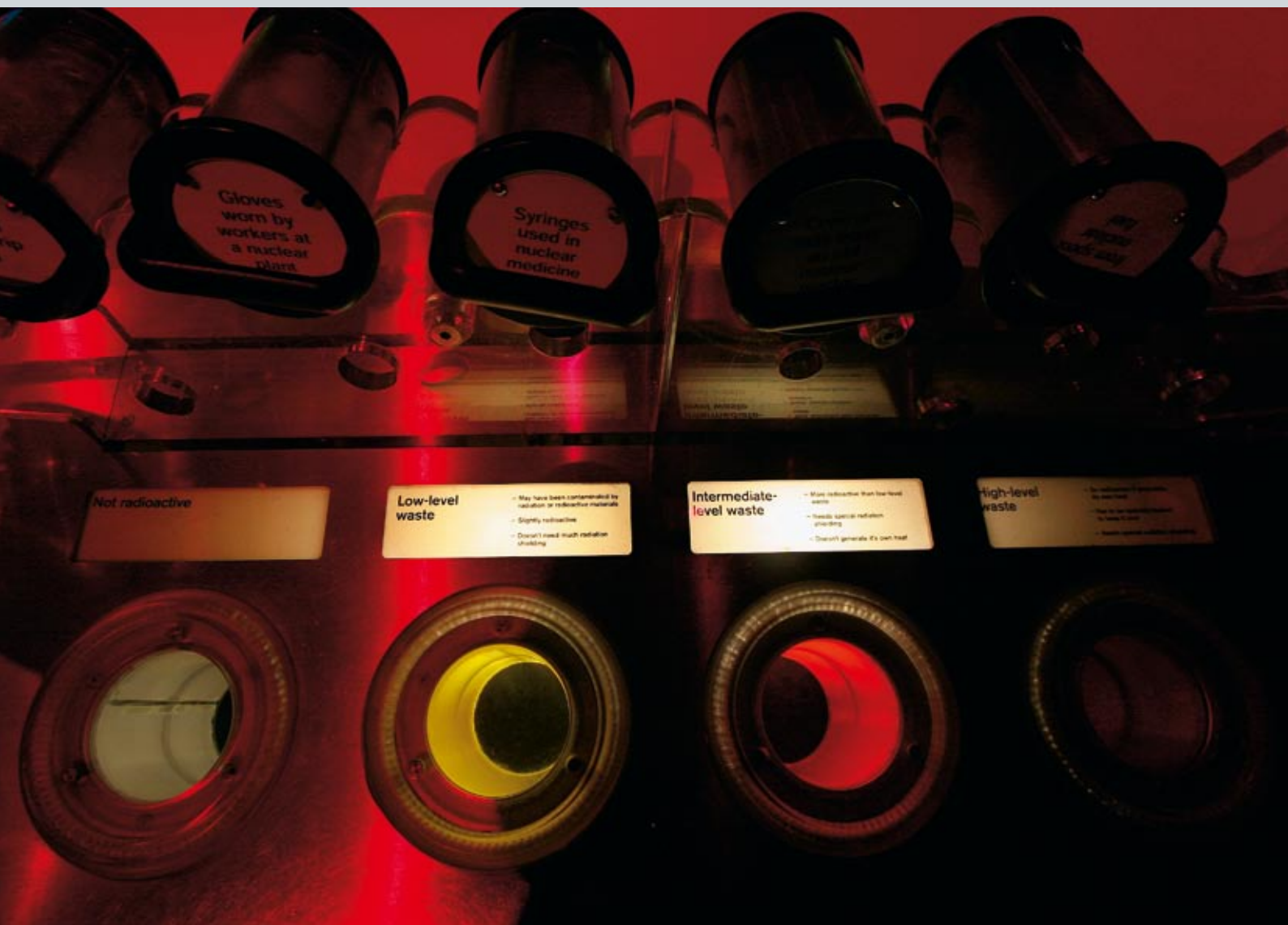


Source: STEM Agency, Trends 1994/3, 1999/3, 2000/4, 2001/11, 2002/10, 2003/6, 2004/5, 2005/6, 2006/4

According to half of the Czech population nuclear power is indispensable in the power generation industry. Over three quarters of citizens believe that in the future, it may cover a significant portion of Czech electricity needs. Similar potential is to be attributed to hydro power plants and to the biomass power generation according to a little more than a half of the population. The public also believes that in the future, imports will be an important source of electricity.

**Views of Czech citizens on power generation from various resources:**  
**“In your opinion, how the following resources may cover power supply of the Czech Republic in the future?”**  
 (in percent)





**Interior view of displays at the visitor centre at Sellafield nuclear power station in Cumbria, United Kingdom.**

**A new generation of atomic power stations can solve out the problem of increased electricity demand and cutting harmful greenhouse gas emissions to the environment.**

# NUCLEAR POWER AROUND THE WORLD TODAY

Nuclear power industry stands at the beginning of a new era of progress which some call the nuclear renaissance.

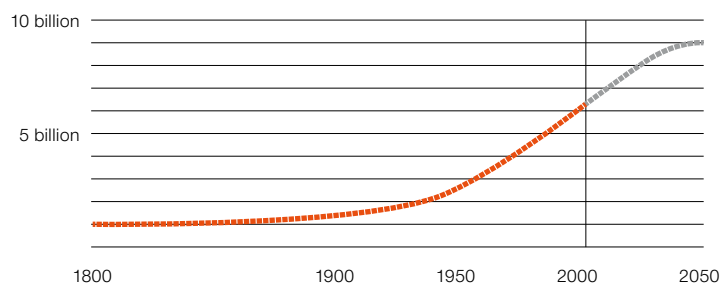
This change is attributed to the general world development, where the number of people on the Earth rises steeply and many developing countries quickly evolve industrially, while parallel to this, the traditional power resources are nearly exhausted. Economy conditions in many regions worldwide are changing and the hunger for new power resources are steadily growing. Safety of sufficient power supply is becoming a hot political theme. Apart of all these facts, global environmental problems increase.

Most serious global problems contributing to the renaissance of nuclear power:

- climate changes attributable to the pollution of the atmosphere with harmful gases (transport, industry, power generation, heating)
- dramatic growth of the world population – in the past 100 years the population of the world has grown by about 4 billion – particularly in developing countries (compared to the previous trend of around one billion of people per 25,000 years), resulting in sharp rise of demand for energy in other parts of the world
- exhaustion of traditional primary power resources (oil, coal, gas), and its no recoverability
- increasing speed and scope of these problems

## Growth of the World Population

(number in billion)



The present situation is yet intensified by the economy of today's world. In Europe, a liberalised electricity market evolves, challenging the power supply companies by market forces. The European Union as follows these changing conditions forms the most important aspects of the EU energy policy in so-called Green Paper – European Strategy for Sustainable, Competitive and Secure Energy.

## Further growth of society directly depends on power generation

Electricity is a unique, clean and convenient form of energy, indispensable in our society. Today, it is apparent that even maximum efficiency of power consumption and progress of power generation from renewable resources, although both are very important, cannot in itself cover the rising demand for electricity in Europe. Even very pragmatic analyses conclude that until 2050, the electricity consumption around the world will double. According to estimates, it will be necessary to built up some 270,000 MW of new power capacity in Europe until 2030, to cover the rising demands and to enable the decommissioning of old power plants. It will be necessary to make use of all the possible power resources, no matter of what kind, be it coal-fueled or nuclear, if the goal of safe and reliable electricity supply is to be ensured.

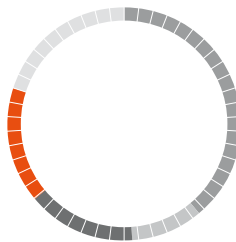


Unfortunately, neither the Czech Republic nor the Europe will be able to rely on imports of power from the surrounding countries in the long-term perspective because the trend is the same worldwide. The world balance of primary power resources' demand is being influenced significantly by the developing countries that have legitimate interest and right for electrification of their countries and economic development.

### Power Generation Worldwide

(in percent)

- coal 39
- oil 10
- gas 15
- nuclear 16
- hydro and renewable resources 20



### Nuclear power plant as a source of clean, safe, and relatively cheap electricity

In the 21st century nuclear power will play a key role in providing safe supply of energy, in increasing competitiveness and in minimising the impact of global climate changes. It is a source of energy which well fits to the world policy of sustainable development:

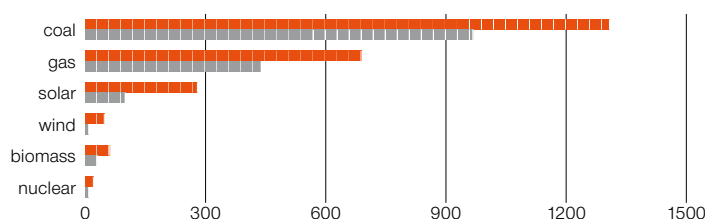
- nuclear power generates clean, safe, and relatively cheap electricity, crucial for maintaining a healthy living standard of today's society.
- nuclear power resources (among other noted resources) produce minimum of carbon dioxide emissions and other greenhouse gases, having the minimal impact on the environment, comparable to renewable resources. This year, NPPs save emissions of about 2,4 billion of tons of CO<sub>2</sub> to the atmosphere. It accounts for over 20% of all CO<sub>2</sub> emissions in relation with power generation.
- raw materials for the production of nuclear fuel are quite abundant on the Earth (for hundreds of years), apart of that the spent fuel can be largely reprocessed.
- nuclear power plants fits very well to the emission-free power resources portfolio, together with renewables.
- nuclear power is suitable also for small countries which do not possess sufficient primary energy resources but need energy for their development.
- nuclear power plants are safe, well secured, and use very resistant protection systems against uncontrolled spread of nuclear materials.
- at present, 443 nuclear power units operate in 30 countries, producing 16% of world electricity. Apart from that, 27 new units are under construction, 38 are officially approved, and further 113 are seriously considered.

### Comparison of Carbon Dioxide Emissions from Power Resources

(g CO<sub>2</sub>/kWh)

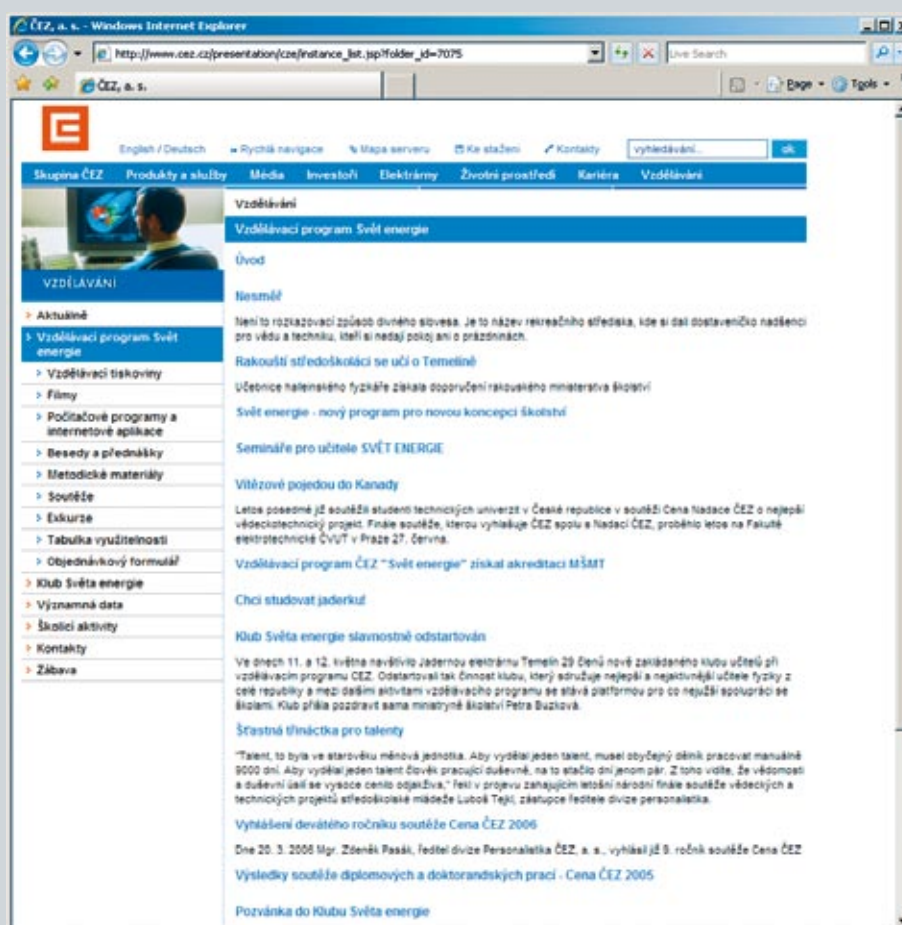
(Calculation also includes the process of components manufacturing)

- High
- Low



## FURTHER INFO ABOUT ČEZ

Constantly, the ČEZ power company strives to inform the public about nuclear power and all related matters. Nuclear physics and energy are a significant part of the educational program for schools entitled The World of Power that is offered to schools, youth, and to the broadest public. An up-to-date choice of materials and events of this educational program can be found at [www.CEZ.cz/vzdelavaciprogram](http://www.CEZ.cz/vzdelavaciprogram). The same Web site contains additional information about operation of both Temelín NPP and Dukovany NPP.



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**Nuclear Power Plants of ČEZ, a. s.**

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