


TOSHIBA

附件-2



**ISOGO NUCLEAR
ENGINEERING
CENTER**

ISOGO NUCLEAR ENGINEERING CENTER

Contributing to Safe and Stable Global Electric Power Supply and Distribution

ISOGO NUCLEAR ENGINEERING CENTER

To balance the needs of economic development with environmental burden, society must consider a new mix of current and new energy sources centered around nuclear power. Based on its past successful technical developments and unique experience, Isogo Nuclear Engineering Center (IEC) can handle all facets of developing, planning, designing, constructing, testing, commissioning and maintaining turnkey nuclear power plants.

We design and build nuclear plants based on a good balance of the three Es - Environment, Economy and Energy.



IEC Main Building Entrance



TV Conference Room



Exhibition Corner



Office



Presentation Room

SCOPE OF IEC ENGINEERING WORK

Toshiba currently promotes R&D, design, manufacturing, construction and services of Boiling Water Reactors (conventional BWRs and ABWRs), one of the most widely used reactors in the world. Toshiba also devotes itself to commercializing Fast Breeder Reactor (FBR) and nuclear fuel cycle facilities and developing future reactors and their element technologies such as fusion reactor and accelerators technology. (Our newly developed ABWR was awarded the Japan Society of Mechanical Engineering Medal 1997 and the 28th Japan Industrial Techniques Grand Prix (the 1999 Prime Minister's Prize))



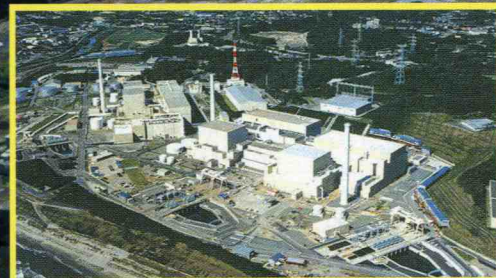
Tohoku Electric Power Co., Inc.
Higashidohri Nuclear Power Station



Tohoku Electric Power Co., Inc.
Onagawa Nuclear Power Station



Tokyo Electric Power Company
Fukushima Daiichi Nuclear Power Station



Chubu Electric Power Co., Inc.
Hamaoka Nuclear Power Station



Tokyo Electric Power Company
Fukushima Daini Nuclear Power Station



Japan Atomic Power Co.
Tsuruga Power Station



Tokyo Electric Power Company
Kashiwazaki-Kariwa Nuclear Power Station

■ NUCLEAR FUEL CYCLE FACILITIES



Reprocessing Plant (Rokkasho Mura)
(Photo: Courtesy of Japan Nuclear Fuel Limited)

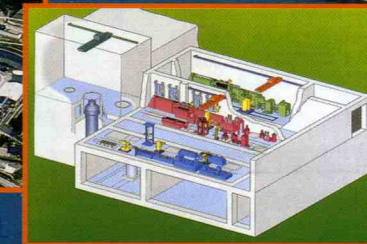


Rokkasho Uranium Enrichment Plant
(Photo: Courtesy of Japan Nuclear Fuel Limited)

■ FAST BREEDER REACTOR



Prototype Fast Breeder "Monju"
(Photo: Courtesy of Japan Nuclear Cycle Development Institute)



Japan Integrated Fast Reactor



High Temperature Engineering Test Reactor

■ FUSION REACTOR AND ACCELERATORS



International Thermonuclear Experimental Reactor (ITER)
(Photo: Courtesy of Japan Atomic Energy Institute)



Super Photon Ring 8GeV (Spring-8)
(Photo: Courtesy of Japan Synchrotron Radiation Research Institute)

PLANNING / DESIGNING

IEC handles total engineering of nuclear power plants by making full use of Computer Aided Engineering (CAE) for planning and basic design of the plant, design of components, integrated systems, control and electrical systems, buildings etc. and design analysis including aseismic evaluation.

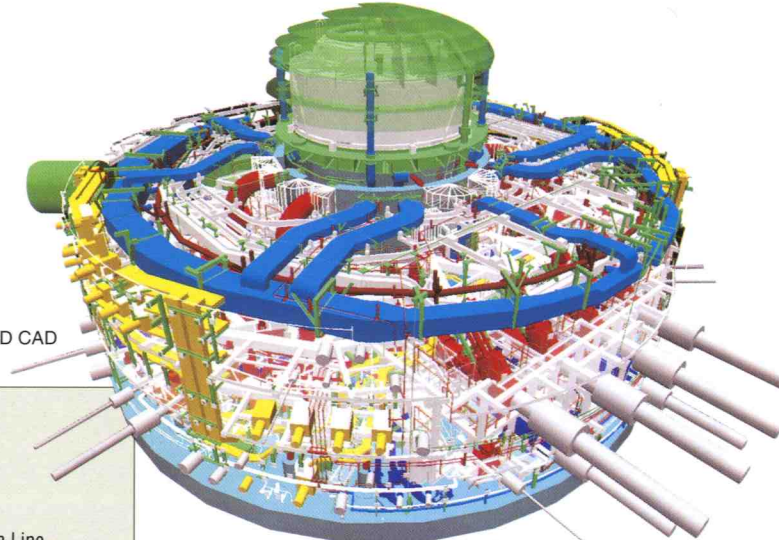
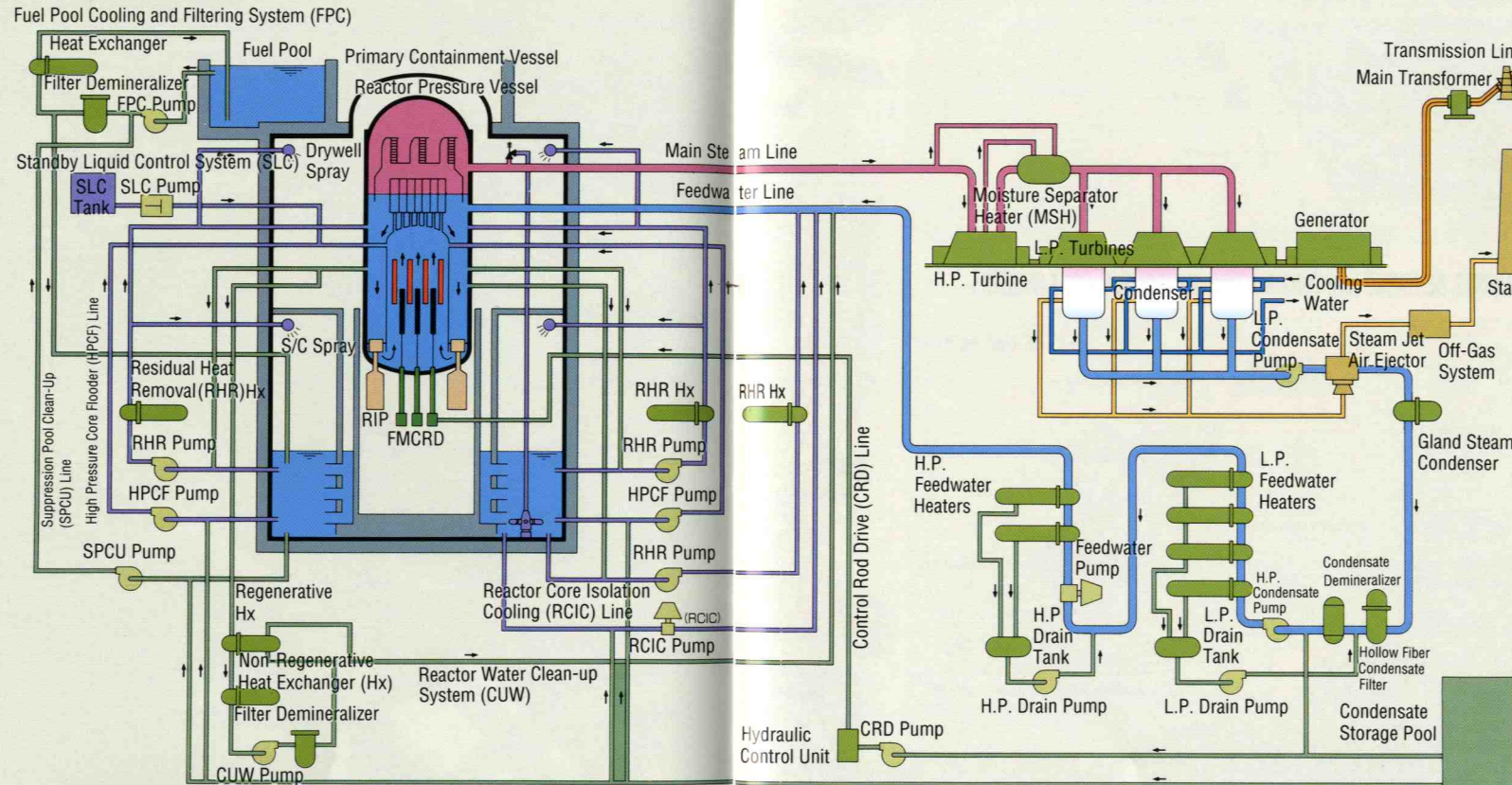
3D Computer Aided Design (CAD) is used to design and layout easy-to-operate and user-friendly plants with due consideration for construction, operation and maintenance.

PLANT CONCEPT DESIGN BASIC SYSTEM DESIGN



SYSTEM DESIGN OF BWR AND ABWR

ABWR System



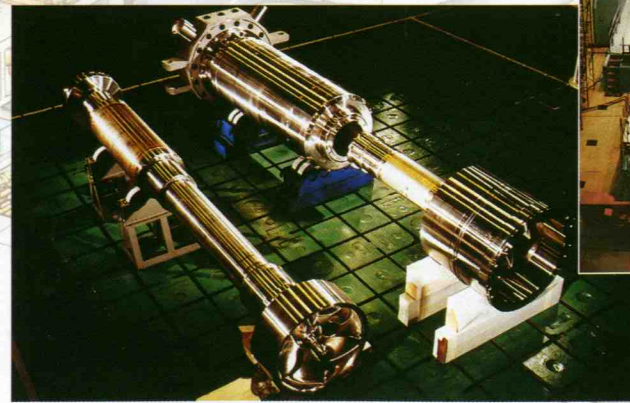
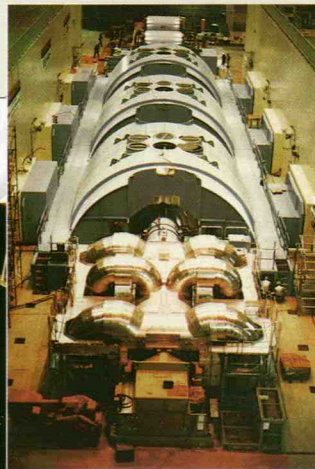
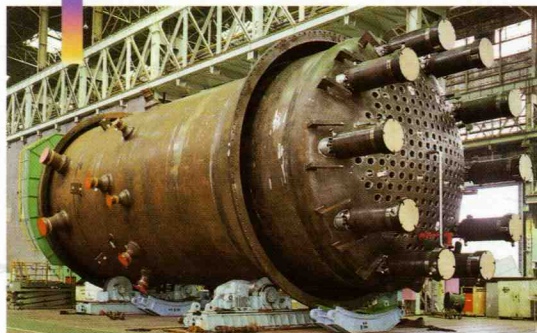
CONTAINMENT VESSEL DESIGN GENERAL ARRANGEMENT ASEISMIC DESIGN ARCHITECTURAL DESIGN



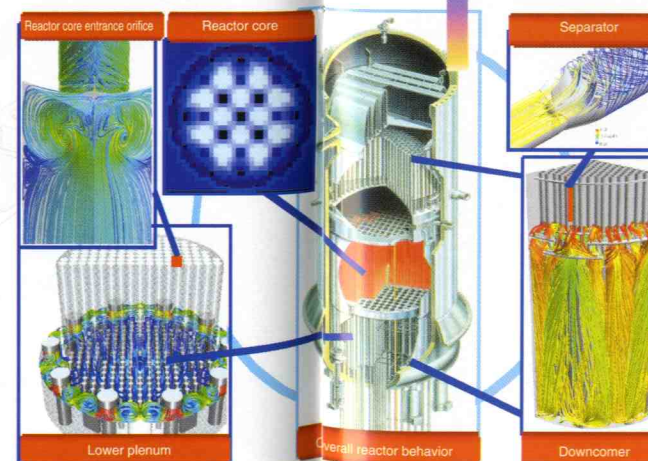
NEXT GENERATION REACTOR



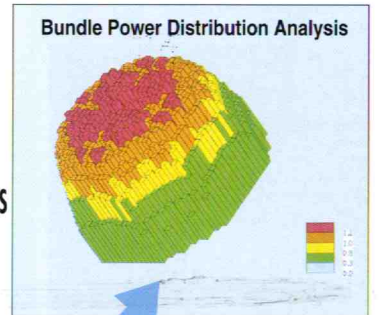
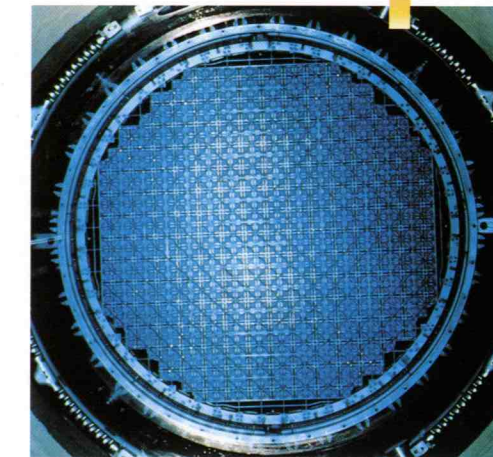
EQUIPMENT DESIGN



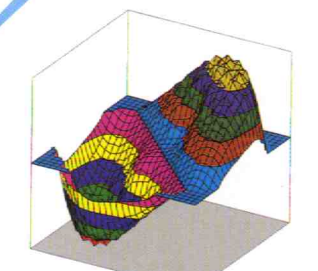
INTEGRATED ANALYSIS



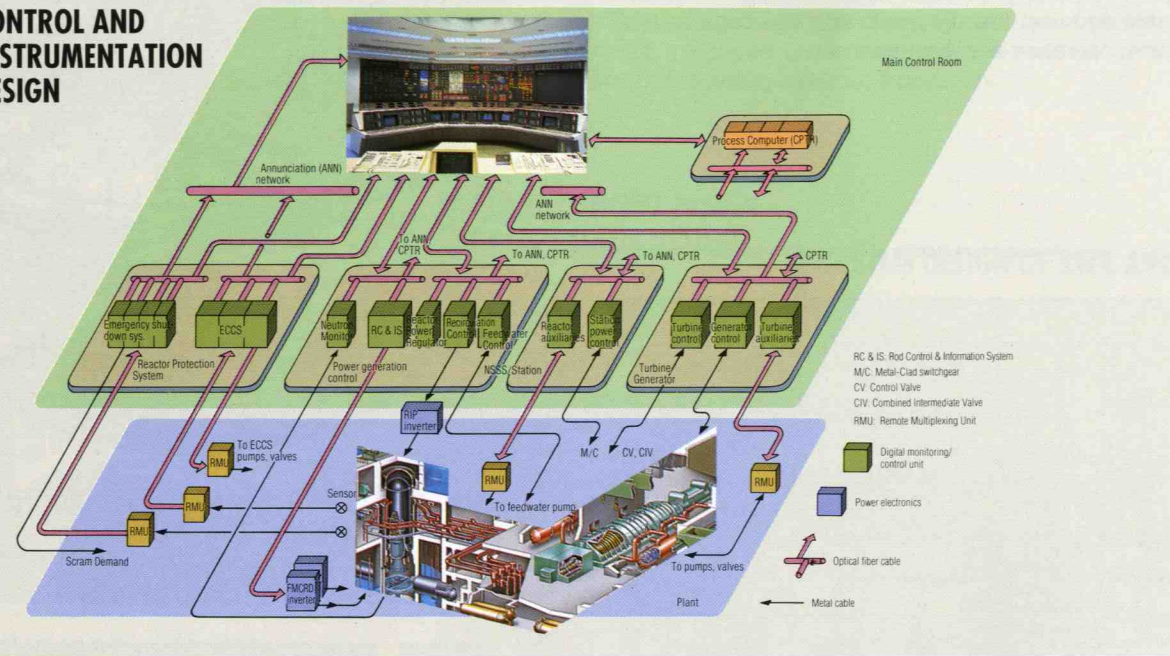
Integrated Analysis Simulated for the Entire Reactor (Associate Calculation by Coupled Individual Component Models)



CONTROL & DYNAMICS DESIGN SHIELDING DESIGN SAFETY DESIGN



CONTROL AND INSTRUMENTATION DESIGN



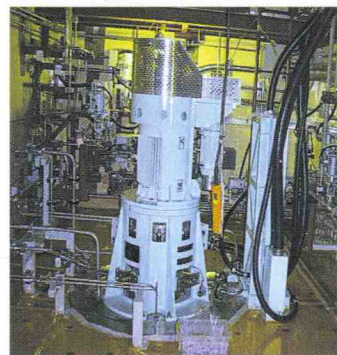
DESIGN AND ENGINEERING OF RADIOACTIVE WASTE TREATMENT SYSTEM



Advanced Cement Solidification System



Hollow Fiber Filter



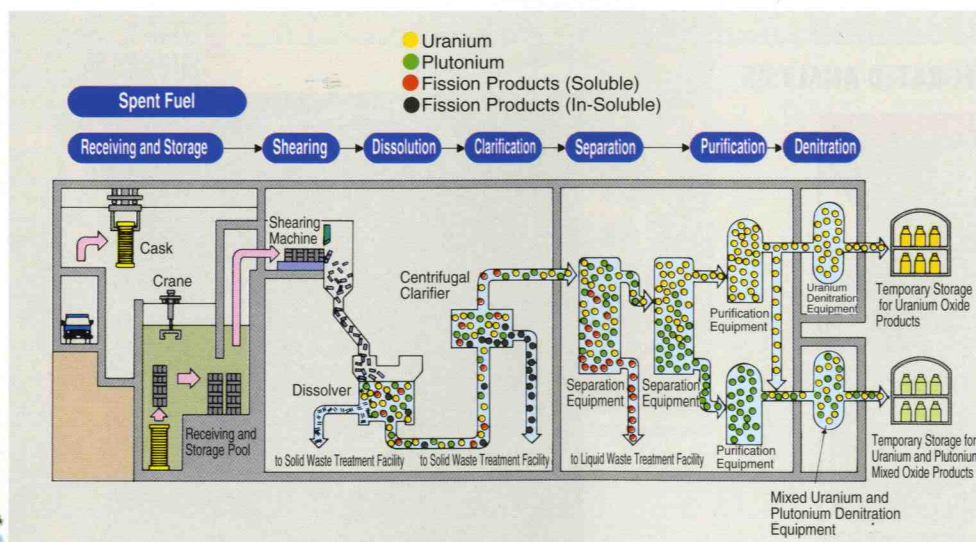
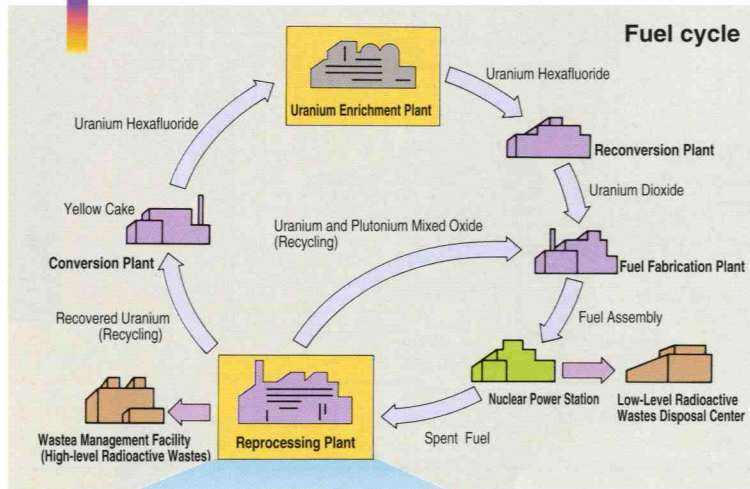
Centrifugal Clarifier

NEXT GENERATION FUEL REPROCESSING



Molten Salt Electrolysis Machine

PLANNING, DESIGNING AND CONSTRUCTING NUCLEAR FUEL CYCLE FACILITIES



Recovered Metallic Uranium Reprocessing Plant Processes

Building Highly Reliable Plant within Reasonable Construction Period

CONSTRUCTION & PRE-OPERATION TEST

IEC provides total plant construction management services. Prior to construction, a schedule is drawn up and detailed plans are established to define construction, transportation, equipment carry-in, planning of temporary equipment, establishment of site organization, etc. IEC also manages various activities after the construction start, including management overall plant construction, adjustment of schedule, control of safety, health, and radiation exposure, quality assurance of equipment and construction, management of pre-operational test, management of site office, etc.

PLANNING & MANAGEMENT OF CONSTRUCTION WORK



REBAR OF FOUNDATION MAT



ASSEMBLY, TRANSPORTATION, INSTALLATION



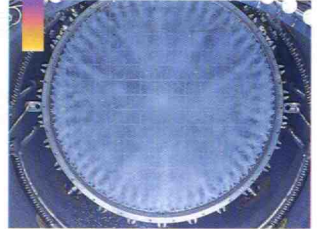
LIFTING REACTOR PRESSURE VESSEL



ASSEMBLING TURBINE



TESTING



PRE-OPERATIONAL TEST



IMPROVED MAINTENANCE ENGINEERING

IEC focuses on preventive plant maintenance to guarantee safe stable operation and to improve the capacity factor. IEC puts strenuous effort into operation support and use of operation/maintenance data, annual inspection support and radiation exposure reduction, development of maintenance technology, and plant maintenance planning.

★We improve operation support and use of maintenance data by integrating plant operating data to respond quickly and with full background knowledge to any abnormalities. We:

- Provide better technical support services
- Develop more reliable plant monitoring and diagnostic systems
- Develop and use new equipment and area diagnostic devices
- Develop more effective and efficient maintenance information systems

OPERATION SUPPORT & EFFECTIVE USE OF OPERATION AND MAINTENANCE DATA

ASSURING SAFE OPERATION AND IMPROVED CAPACITY FACTOR


DEVELOPING IMPROVED MAINTENANCE TECHNOLOGY

★We are reviewing and improving our maintenance technology to retrofit plant and facilities through:

- Development of repair and inspection technology
- Development and demonstration of equipment by using plant refurbishment technological development facilities


Condition Monitoring

Advanced Monitoring




Focused Equipment Monitoring

Efficient Inspections




Compact Maintenance Tool

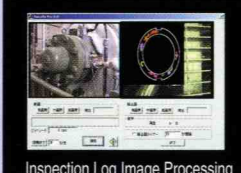
Detailed Diagnosis




Equipment Kavte Diagnosis



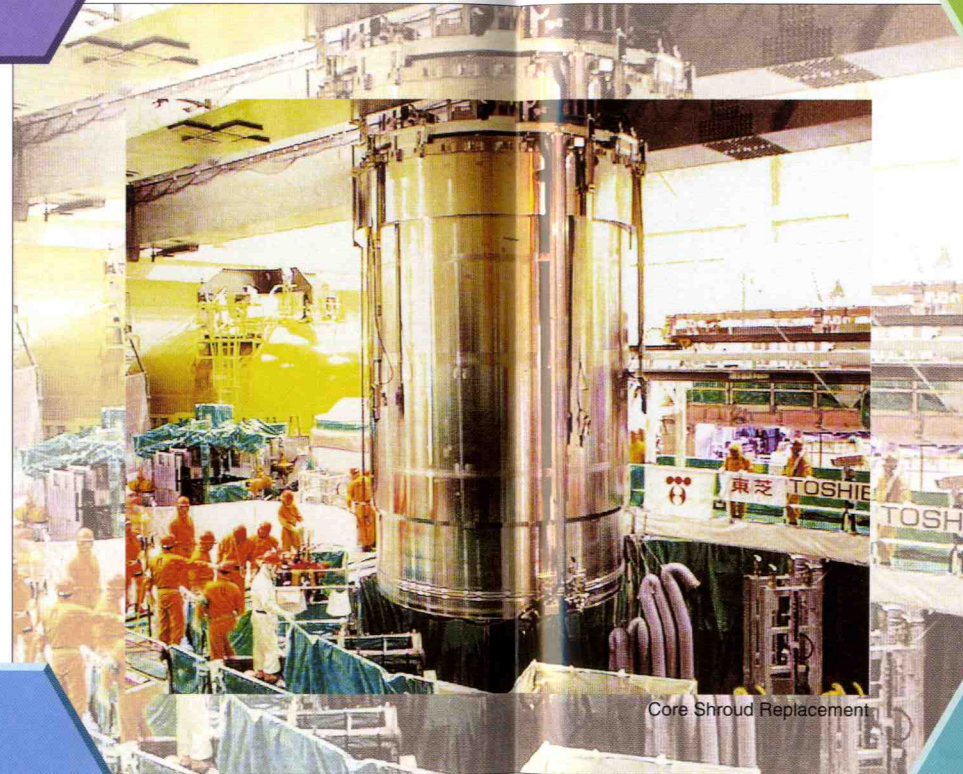
Wide area Equipment Monitoring



Inspection Log Image Processing

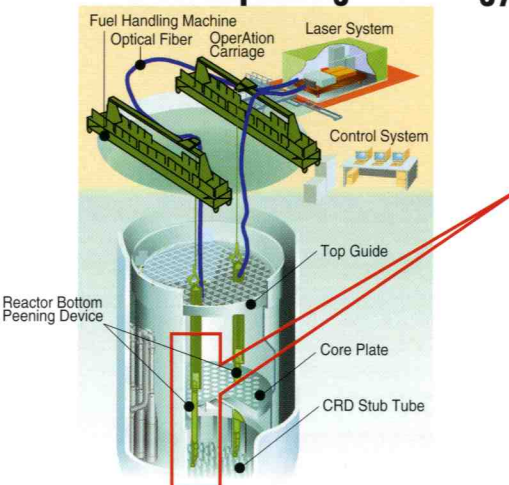


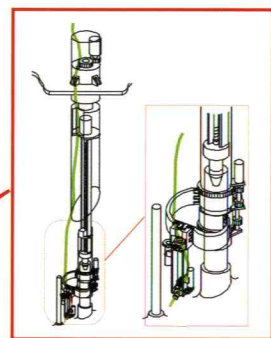

Risk monitor



Core Shroud Replacement

Fiber laser peening technology



★To ensure safe operation, we implement assured maintenance based on the following:

- Implementing trouble-prevention activities
- Taking measures against aging to extend plant life
- Responding appropriately to ongoing and future restrictions
- Establishing medium- and long-term maintenance plans
- Proposing improvement and refurbishing plans

MAINTENANCE PLANNING

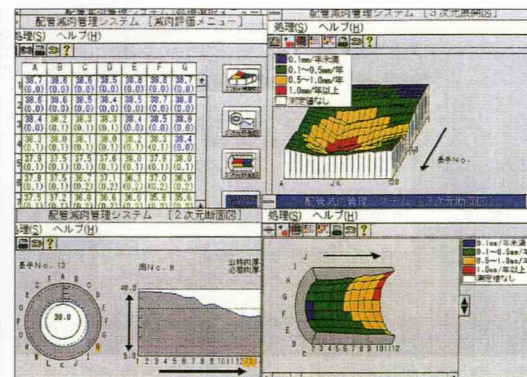
SUPPORT FOR ANNUAL OUTAGE AND REDUCED RADIATION EXPOSURE

★To shorten the annual inspection outage, we endeavor to assure better periodic inspection work by:

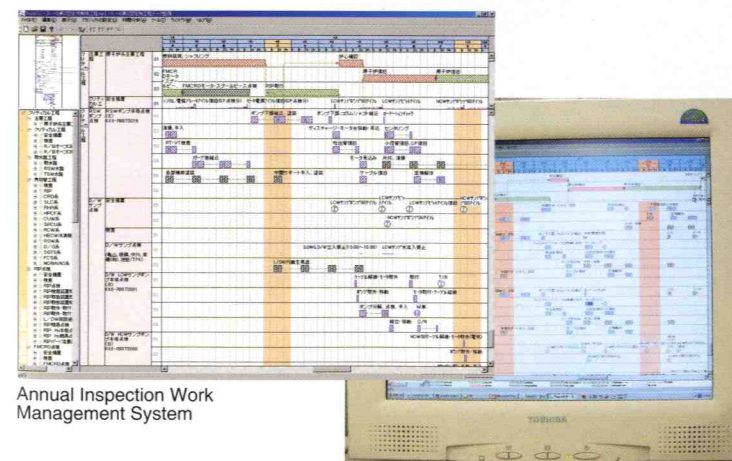
- Reducing refueling outage
- Making annual inspection more efficient
- Developing better annual inspection management system
- Reducing radiation exposure at annual inspection



Further Improvement of Main Control Room Function



Piping Thickness Management System



Annual Inspection Work Management System

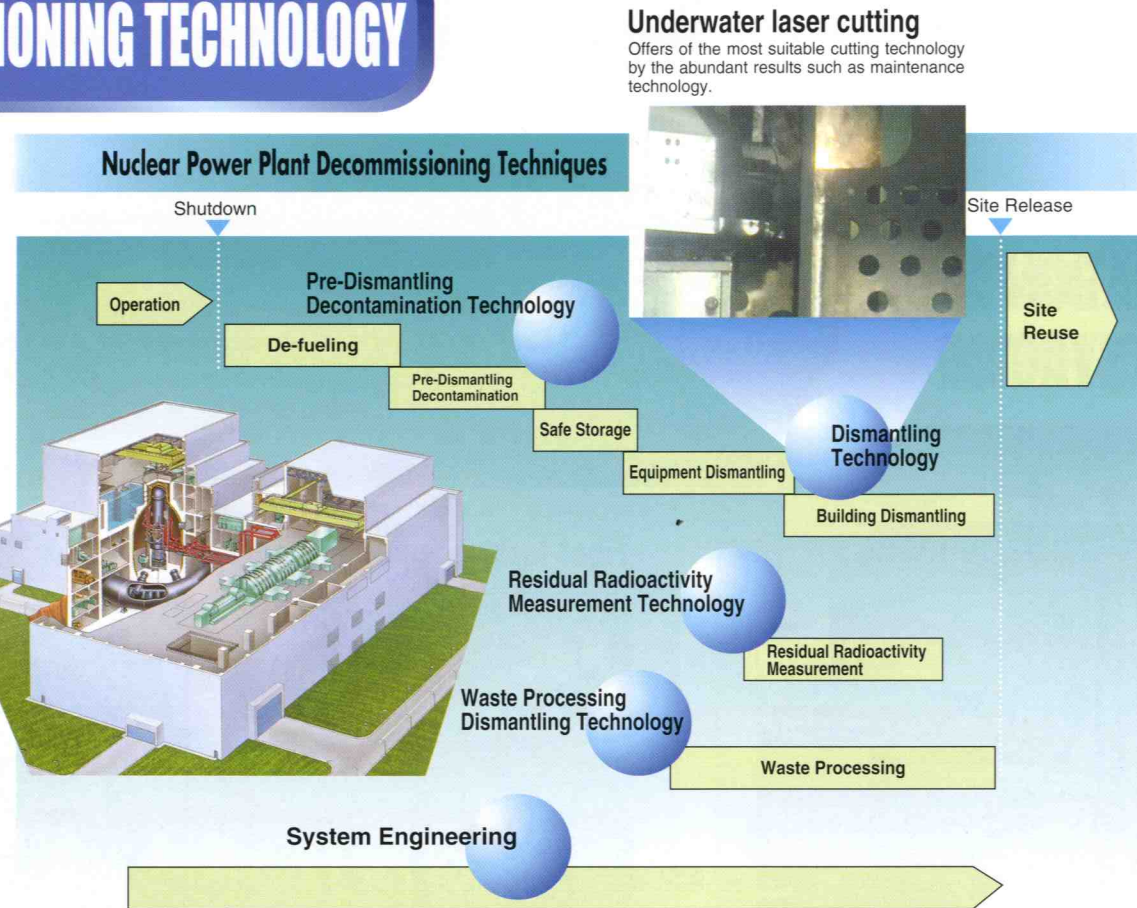


Underwater Dryer/separator Handling Device

For Nuclear Power Plant (NPP)
which finished its role

DECOMMISSIONING TECHNOLOGY

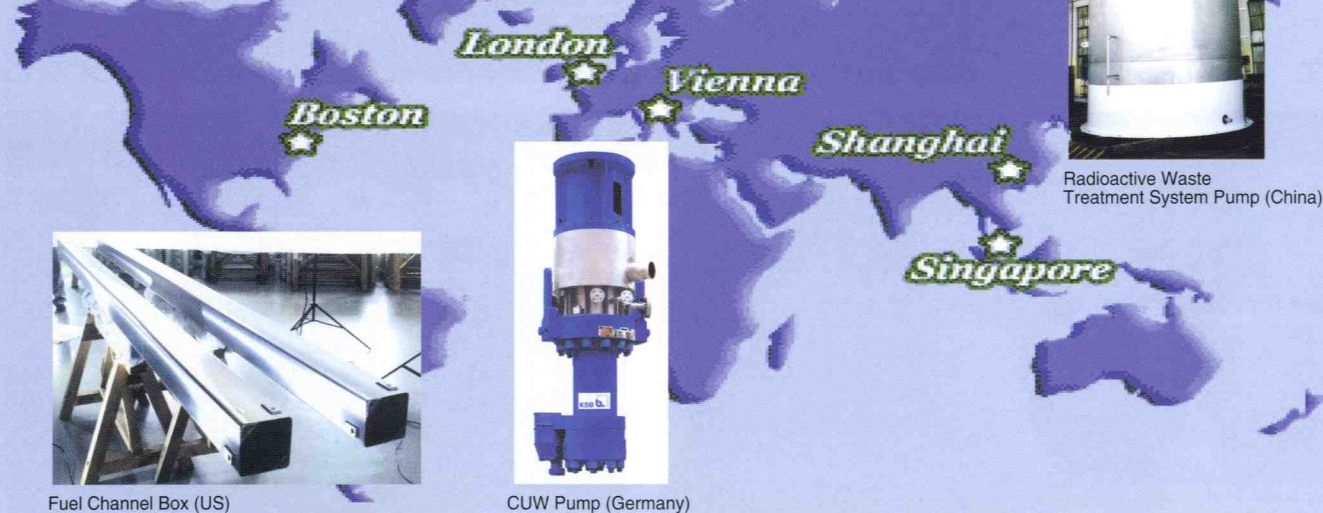
Japan's first commercial nuclear power plant (NPP) started operation in 1966. However, when a nuclear power plant reaches the end of its design life, it must be decommissioned and demolished as quickly as possible. Our rich knowledge of maintenance technology obtained over many years of hands-on experience has enabled us to develop advanced technologies for decommissioning nuclear plants as cost-effectively as possible.



Purchasing World's Best Equipment

PROCUREMENT ACTIVITIES

- Thorough VA/CD integrated with design dept.
- Overseas acquisition bases utilized for optimum purchasing.
- Reduction of cost achieved by collaboration with suppliers



GOAL FOR IEC

Targeting World Market with

ASSURED QUALITY

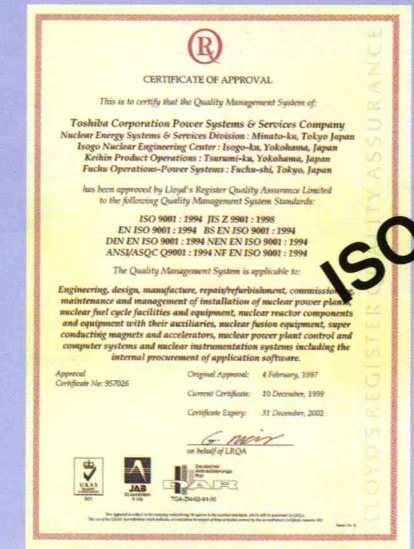
Aiming to establish
Global Quality Assurance
System for Nuclear Plants

ISO9001 Certificate

In February 1997, Toshiba's Nuclear Energy Systems & Services Division obtained the ISO9001 Quality Management System Standards certificate. Toshiba is the first company awarded this recognition through head office, Isogo Nuclear Engineering Center Shop and Site in the nuclear industry in Japan.

The Quality Management System is applicable to:

Engineering, design, manufacturing, repair/refurbishment, commissioning, maintenance and management of installation of nuclear power plants, nuclear fuel cycle facilities and equipment, nuclear reactor components and equipment with their auxiliaries, nuclear fusion equipment, super conducting magnets and accelerators, nuclear power plant control and computer systems and nuclear instrumentation systems including the internal procurement of application software.

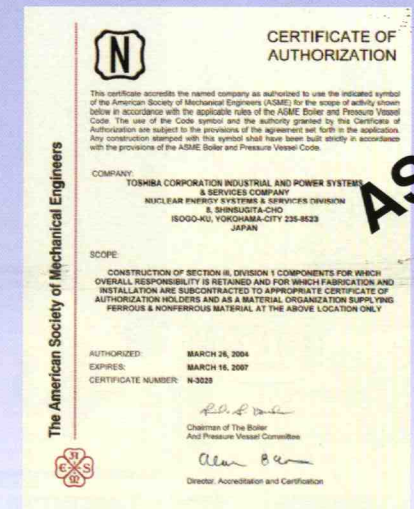


ASME Certificate

Certificate that we comply with the requirements of the American Society of Mechanical Engineers (ASME), for oversea's nuclear business was obtained in Mar. 2001. We are the first engineering organization to obtain ASME certification in Japan. We globally offer high quality design, products, construction/maintenance through quality assurance activities in compliance with the laws and agreements of the various countries of the world.

Scope of certification:

Construction of section III, division 1 components for which overall responsibility is retained and for which fabrication and installation are subcontracted to appropriate authorization holders and as a material organization supplying ferrous & nonferrous material at the above location only.

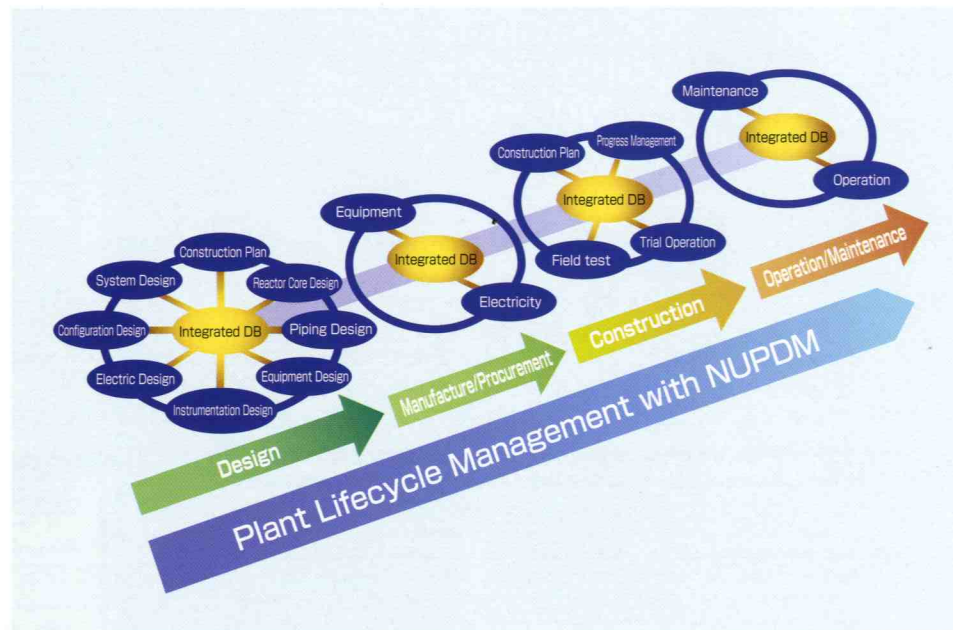


INTEGRATED INFORMATION CONTROL WITH NUPDM ACHIEVING BEST NUCLEAR POWER PLANT LIFECYCLE SUPPORT

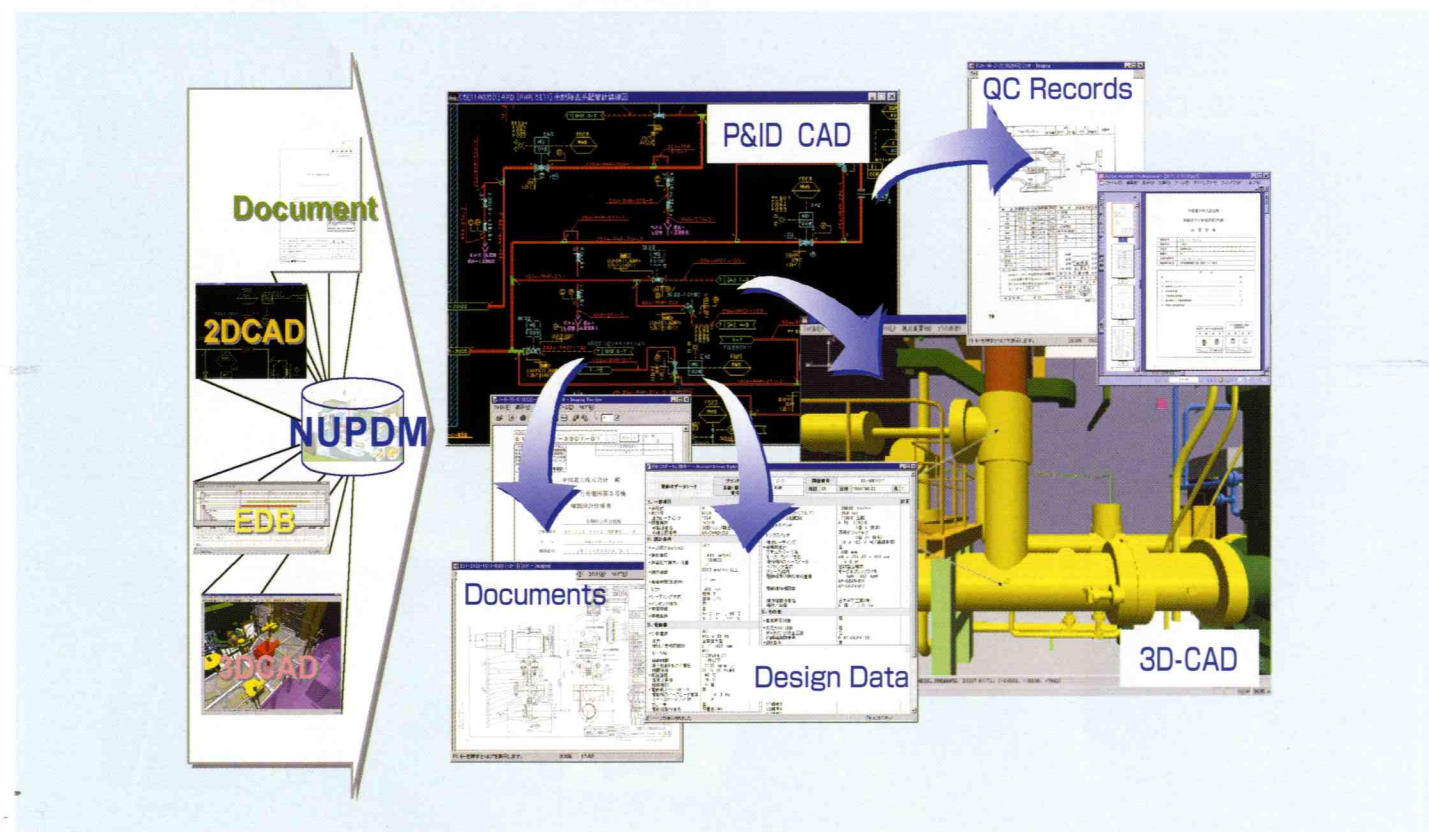
For sustained improvement of quality over the plant life cycle

Enormous amounts of technical information are produced throughout the "plant life cycle", i.e. design, manufacture, procurement, construction, operation and maintenance in nuclear power engineering.

At Toshiba, we developed NUPDM (Nuclear Plant Data Management System) as a platform for the unified management of this technical information, and perform high quality, high-reliability engineering with IEC.

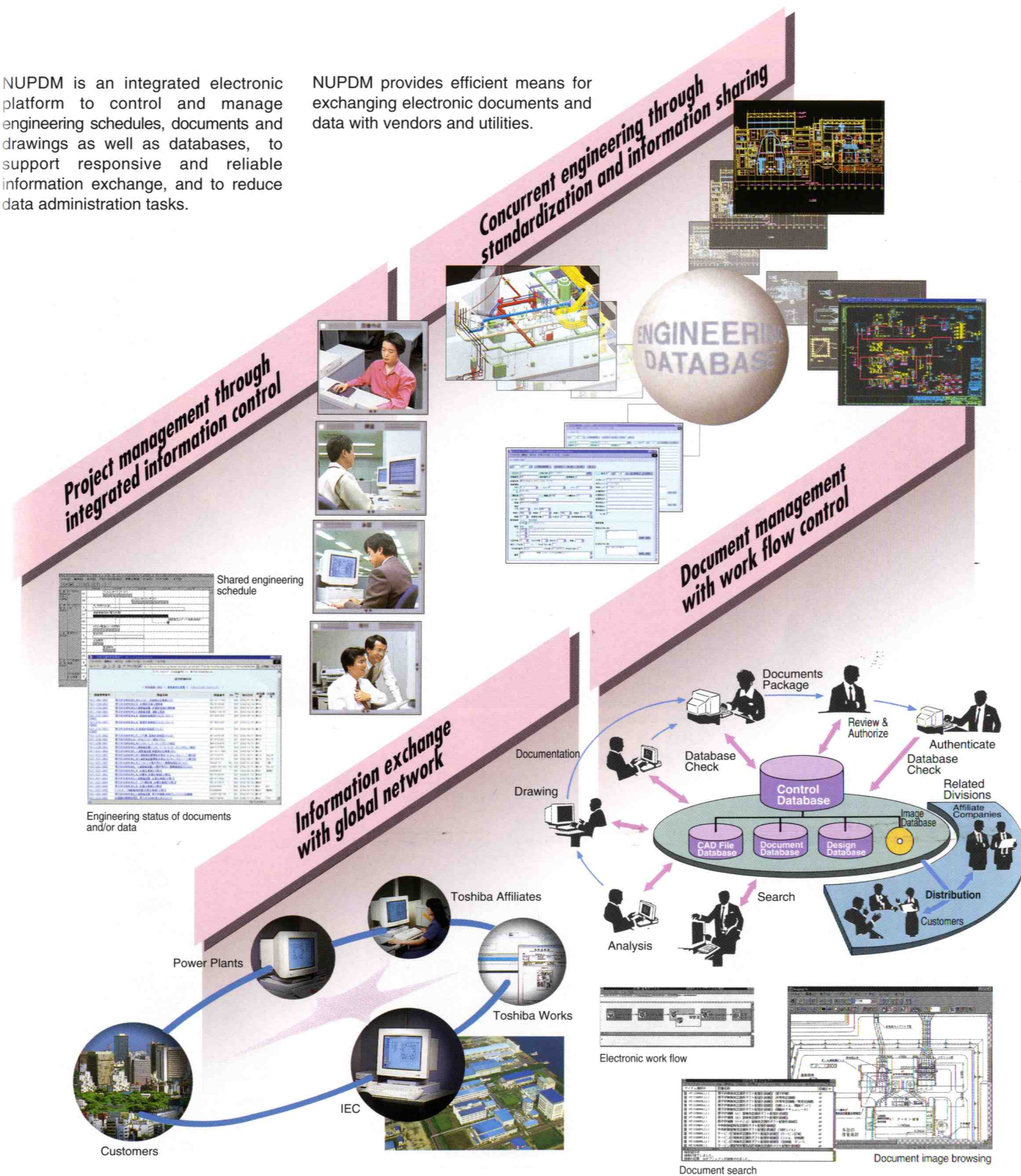


Sharing design information through integrated database



NUPDM is an integrated electronic platform to control and manage engineering schedules, documents and drawings as well as databases, to support responsive and reliable information exchange, and to reduce data administration tasks.

NUPDM provides efficient means for exchanging electronic documents and data with vendors and utilities.

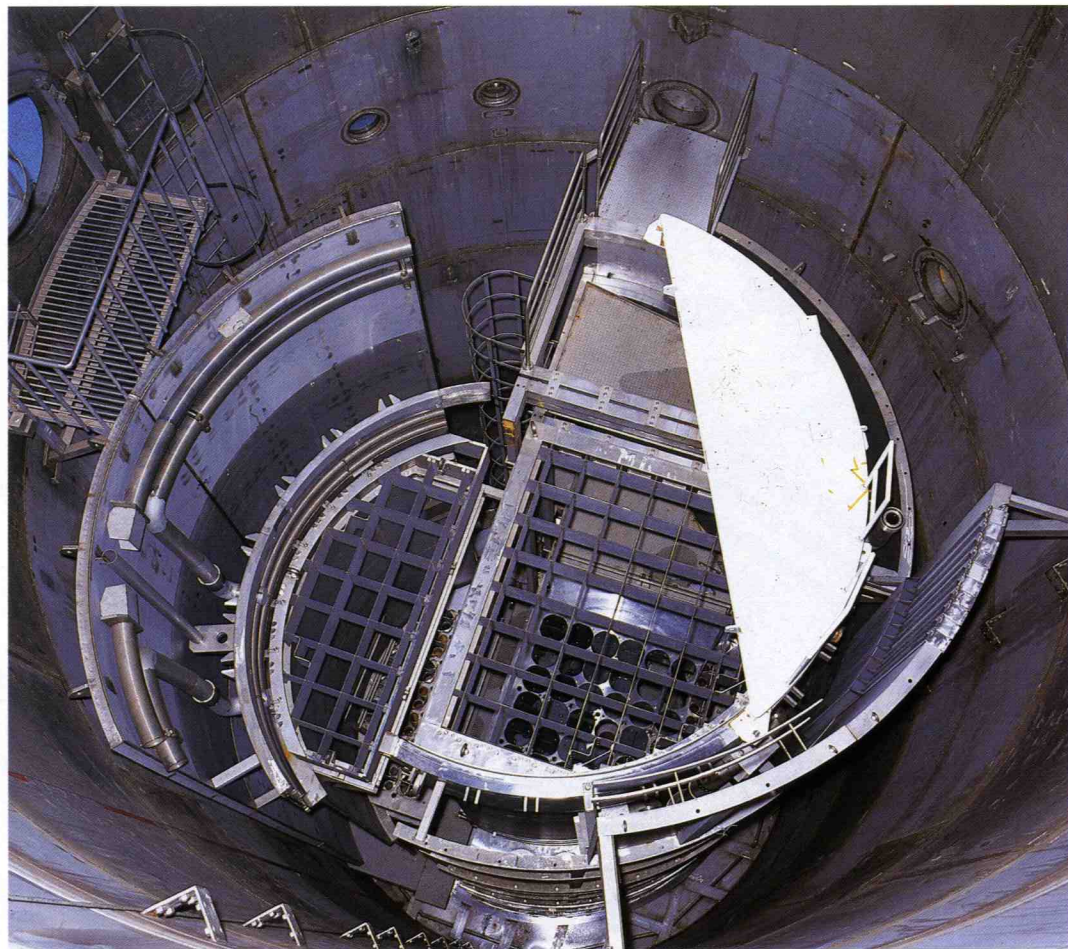


INTEGRATION OF DESIGN WORK AND R&D

The large-scale R&D facilities of the Nuclear Engineering Laboratory are located next to IEC to closely link R&D and design engineering. The advanced control rod drive mechanism of BWRs is under further improvement and advanced maintenance technology such as laser peening is also under development using full-scale mockup facilities. R&D and design also integrate various uses of robotics, diagnostics and laser technology in advanced maintenance systems.



Laser Peening
(Reactor Bottom Peening Device)



Plant Preventative Maintenance Technology Development Facility

Underwater inspection robot (for inspecting inside reactor vessel narrow spaces)



Small Vehicle



Flat Vehicle



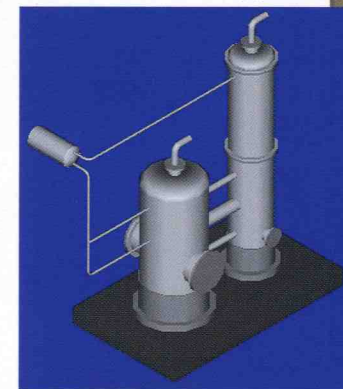
Laser Peening Test Overview



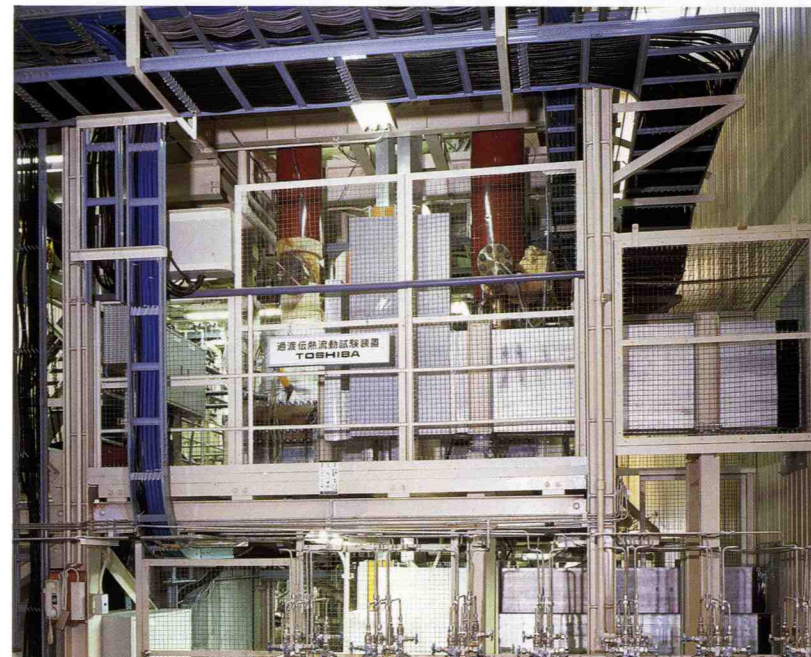
SCC Growth Rate Evaluation Equipment



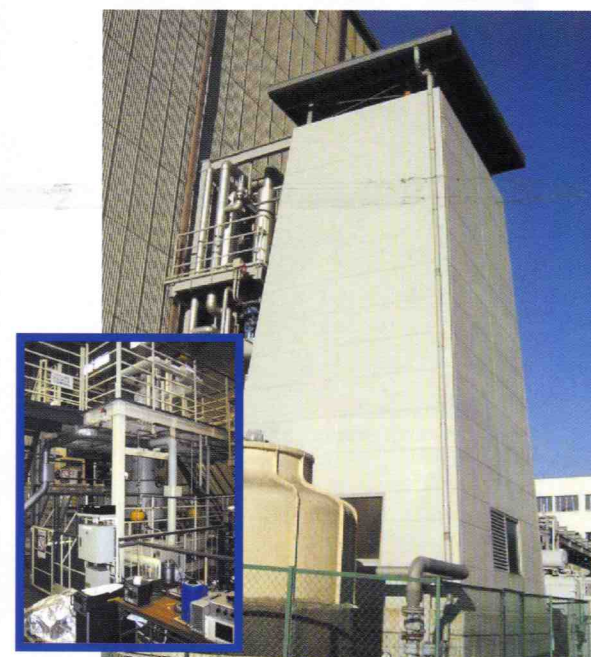
Reactor Flow Test Facility



Innovative Safety Systems Research Facility



Thermal-Hydraulic Transient Test Facility



High Temperature Flow Test Facility

*Shot peening: preventive maintenance based on stress improvement of reactor internal structures

IEC PUBLIC ACCEPTANCE ACTIVITIES

To achieve better acceptance of nuclear energy by the public, a scale model of a nuclear power plant, a full-scale model of reactor internals, an engineering model of a containment vessel, etc., are on display in the Exhibition Corner. IEC also arranges tours that include a demonstration of nuclear power plant layout using 3D CAD, and a visit to the large-scale R&D facility and mock-up pressure vessel.



Full-Scale Nuclear Reactor Internal Equipment



Mock-up of ABWR Reactor & Containment



Internal Pump Disassembled Parts



Facility for Developing Plant Preventative Maintenance Technologies and Full-scale Mock-up of Reactor Pressure Vessel

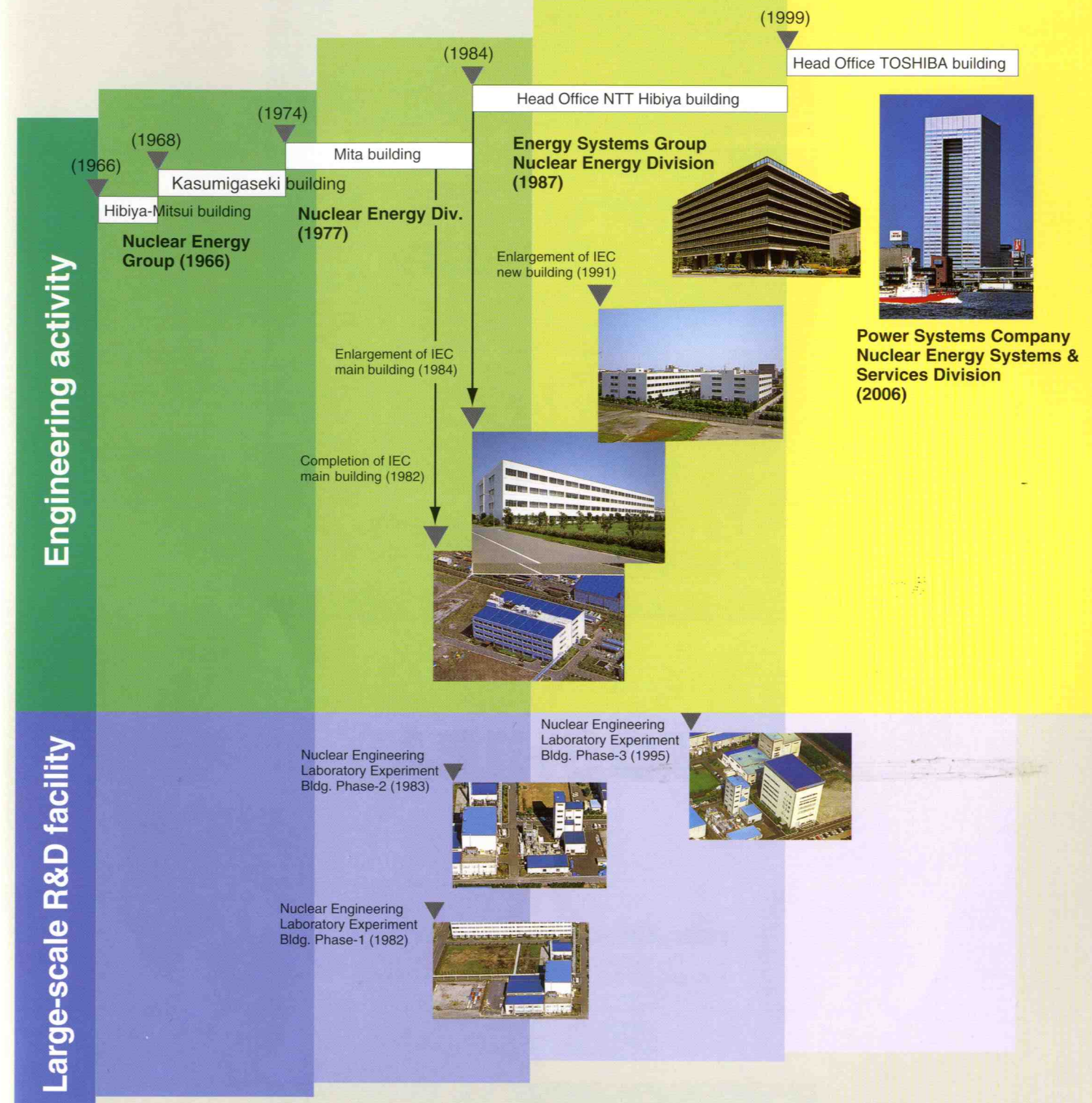


Lecture of Radiation using Radiation Measurement Kit

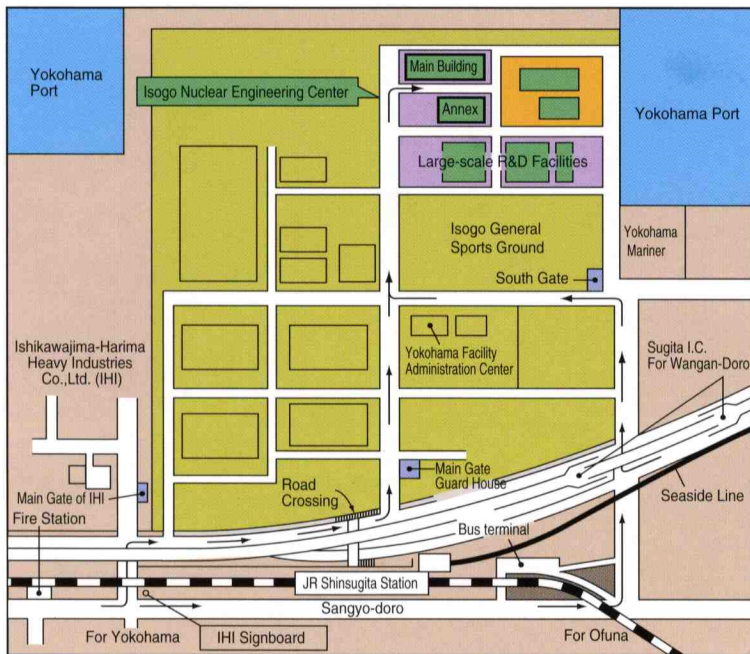
History of Nuclear Energy Systems & Services Division

Toshiba Nuclear Energy Systems & Services Division is well organized to provide consistent services based on its considerable experience, ranging from planning, designing, constructing, and maintaining nuclear plants to manufacturing equipment, training operators and R&D.

IEC is making steady progress toward commercialization of Fast Breeder Reactor and the nuclear fuel cycle facilities.



Guide to Isogo Nuclear Engineering Center



TOSHIBA



TOSHIBA CORPORATION

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NUCLEAR ENERGY SYSTEMS & SERVICES DIVISION**

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