

Preservation and Enhancement of Nuclear Knowledge Towards Indonesia's Plan to Operate First Nuclear Power Plant By 2016

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BATAN



INTRODUCTION

Indonesia: A Developing Country Preparing for Nuclear Power

- Nuclear Power should be an integral part of National Energy Policy Program.
- Separation of Regulatory Body from Promoting Body as the implementation on the Act No. 10 year 1997 followed by organization restructuring.
- In the early stage, be focused on strengthening national capacity building through:
 - Human Resources Development.
 - Scientific Facilities Development.
 - National Participation & Technology Transfer.
- Human resources development through education and training program for acquisition and improvement of scientific knowledge, and development of technological capability (know-how, facilities).



BACK GROUND



- Indonesia is the largest archipelago in the world. It consists more than 17.500 islands (6,000 inhabited) and five major islands (Sumatra, Java, Kalimantan, Sulawesi, Irian Jaya).
- The total population is approximately 214 millions but more than half of Indonesia's people live on the island of Java .
- The Java Island has large population and industries, which constitutes the major area of energy demand.



Some Basic Issues

STRATEGIC ISSUES

- Longterm supply of energy for sustainable development
- Economic value of fossil resources
- Environmental care

SCIENTIFIC-TECHNICAL ISSUES

- Site, type and size of power reactor
 - Nuclear safety
 - Fuel cycle and waste management
- } Human Resources
(Nuclear Knowledge)

SOCIO-ECONOMIC AND POLITICAL ISSUES

- Economic and financing
- Public acceptance
- Local content (support & participation of local industry)
- Proliferation and Security of fuel supply

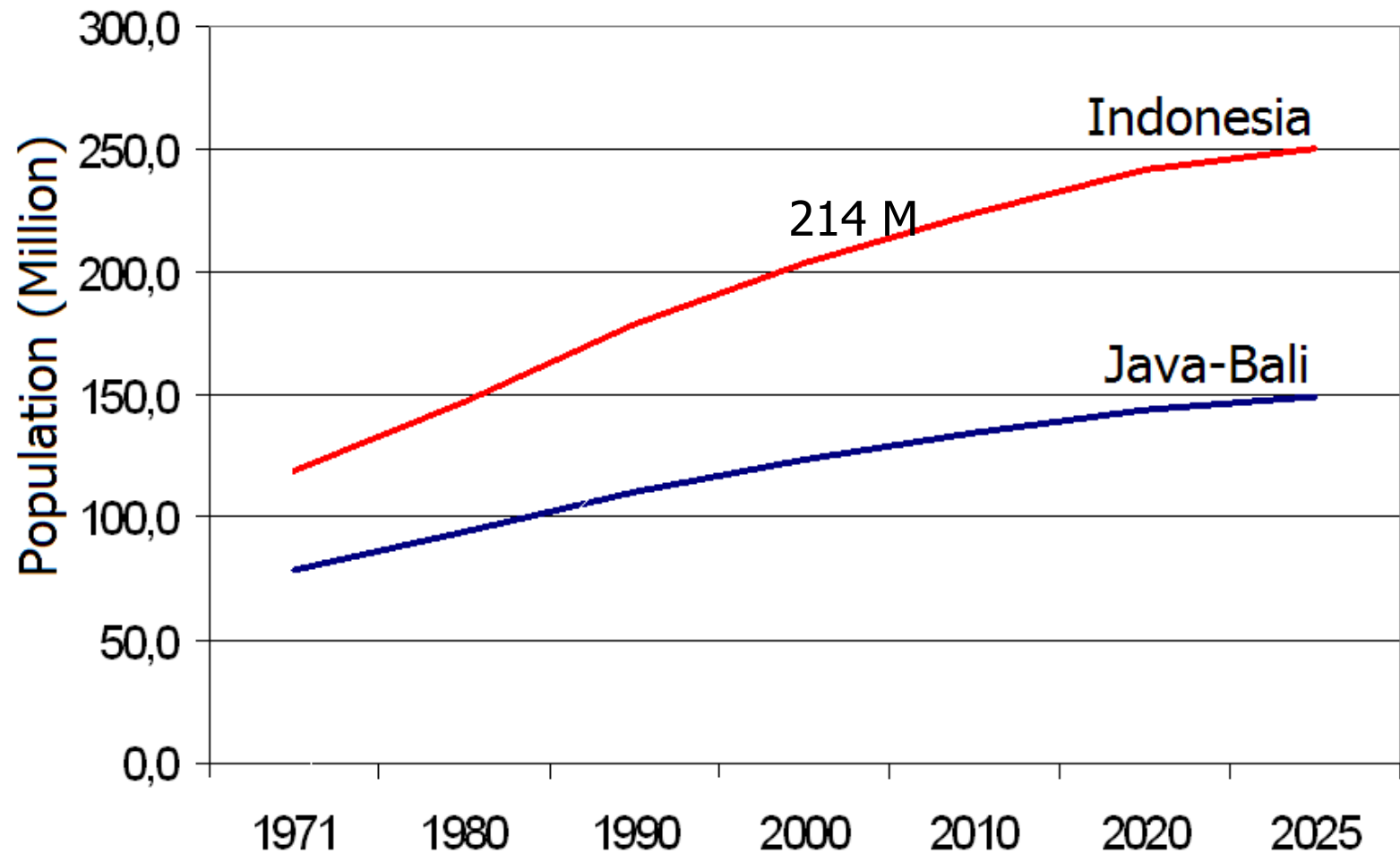


Recent Study: CADES

- The recent study (2002) under IAEA technical co-operation project titled “Comprehensive Assessment on Different Energy Sources for Electricity Generation in Indonesia” .
- The main objective is to support the national planning and decision-making process in Indonesia’s energy and electricity sectors.
- Taking into account key **economic, social and environmental factors**.
- The conclusion showed that an energy mixed scenarios has to be applied in Indonesia in order to reduce amount of oil used for transportation and electricity generation.
- The medium to large scale of NPP would be techno-economically feasible to be operated in 2015-2016 for Java Island.



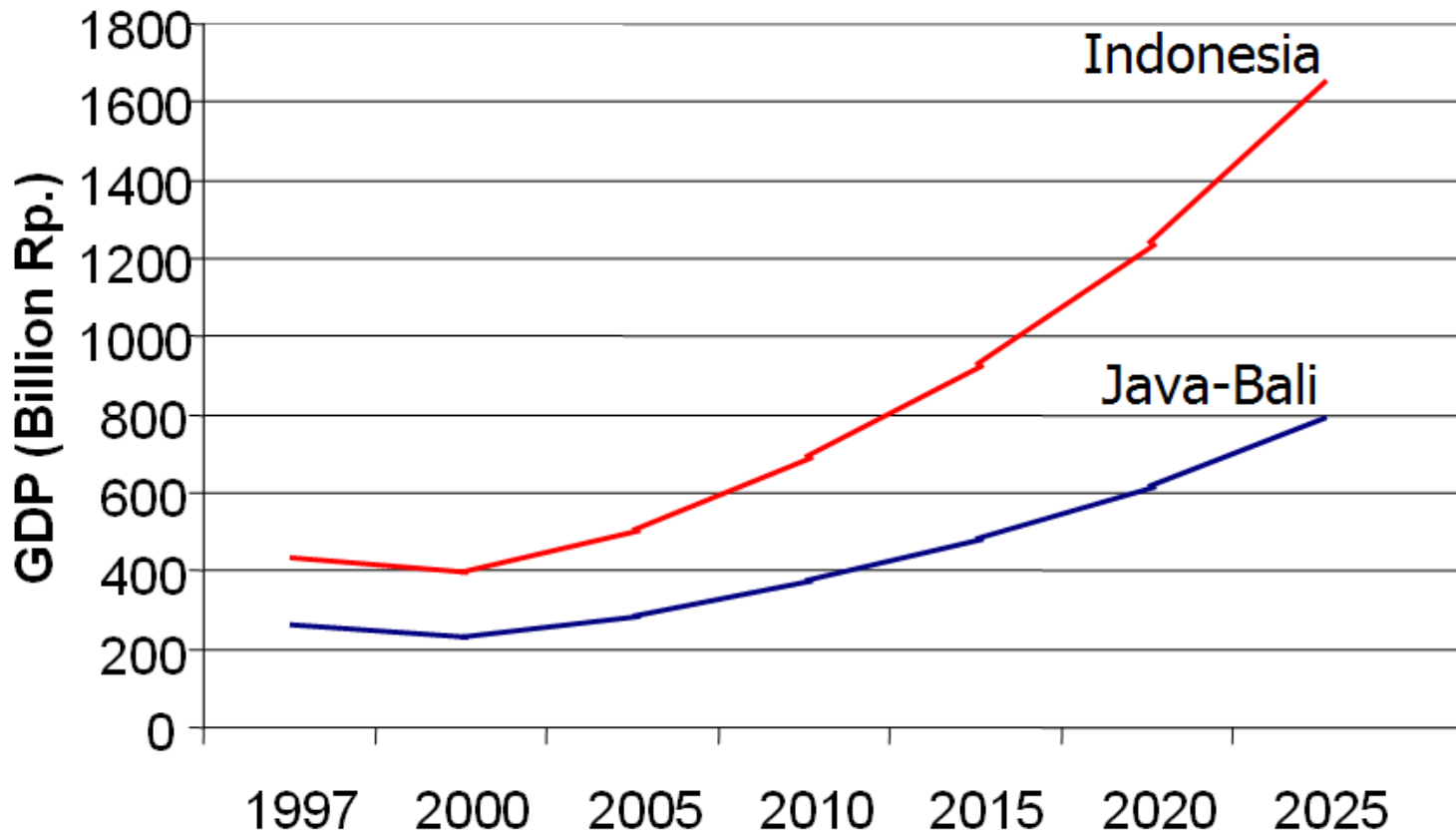
The Population Projection



- The total population in 2004 : 214 millions
- The population projection in 2025 : 250 millions.



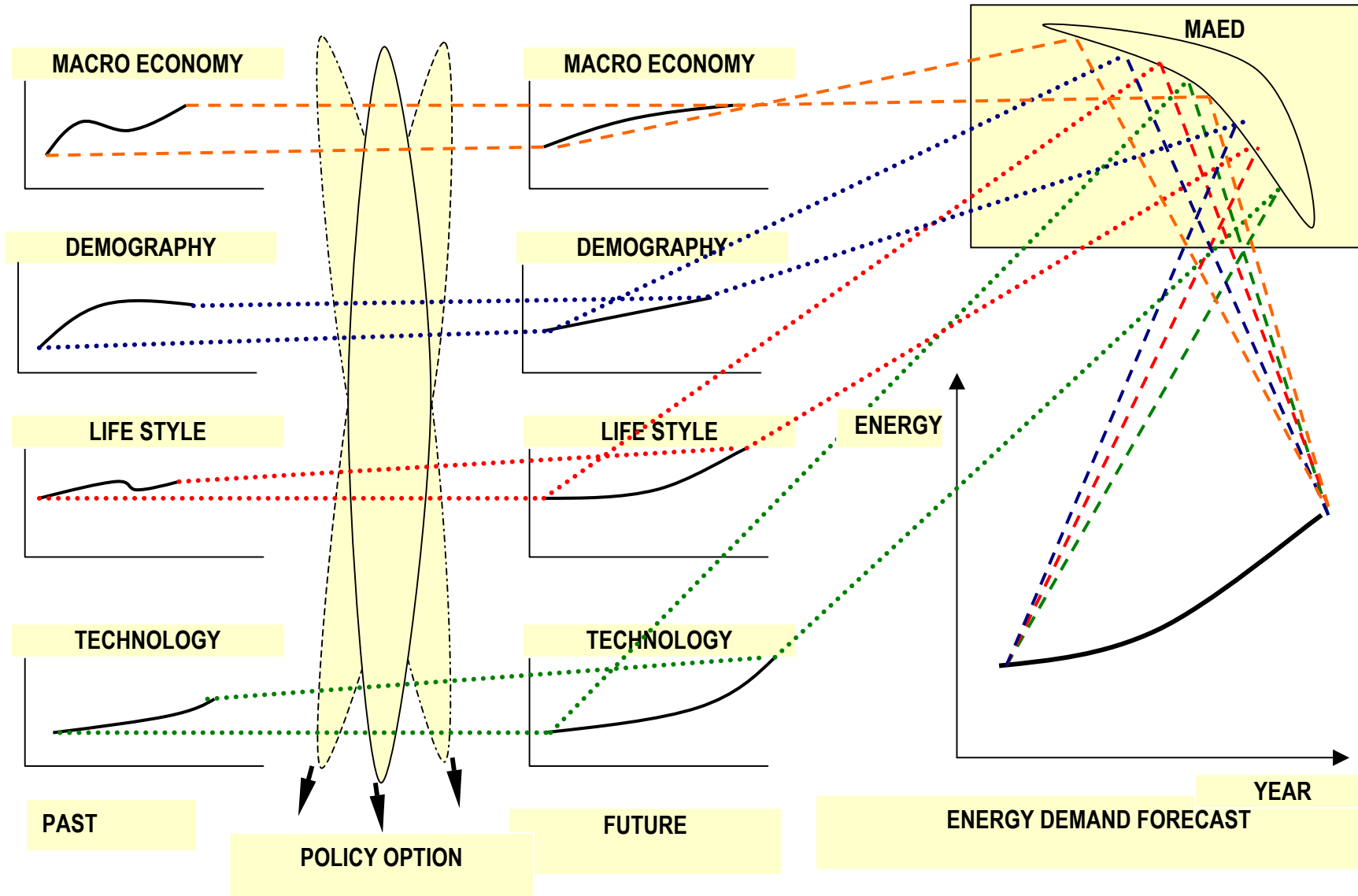
Economic Growth Estimation



- The economic growth estimation in 2005: 5.6%.
- The average economic growth (2006 to 2025): 5.5% to 6%

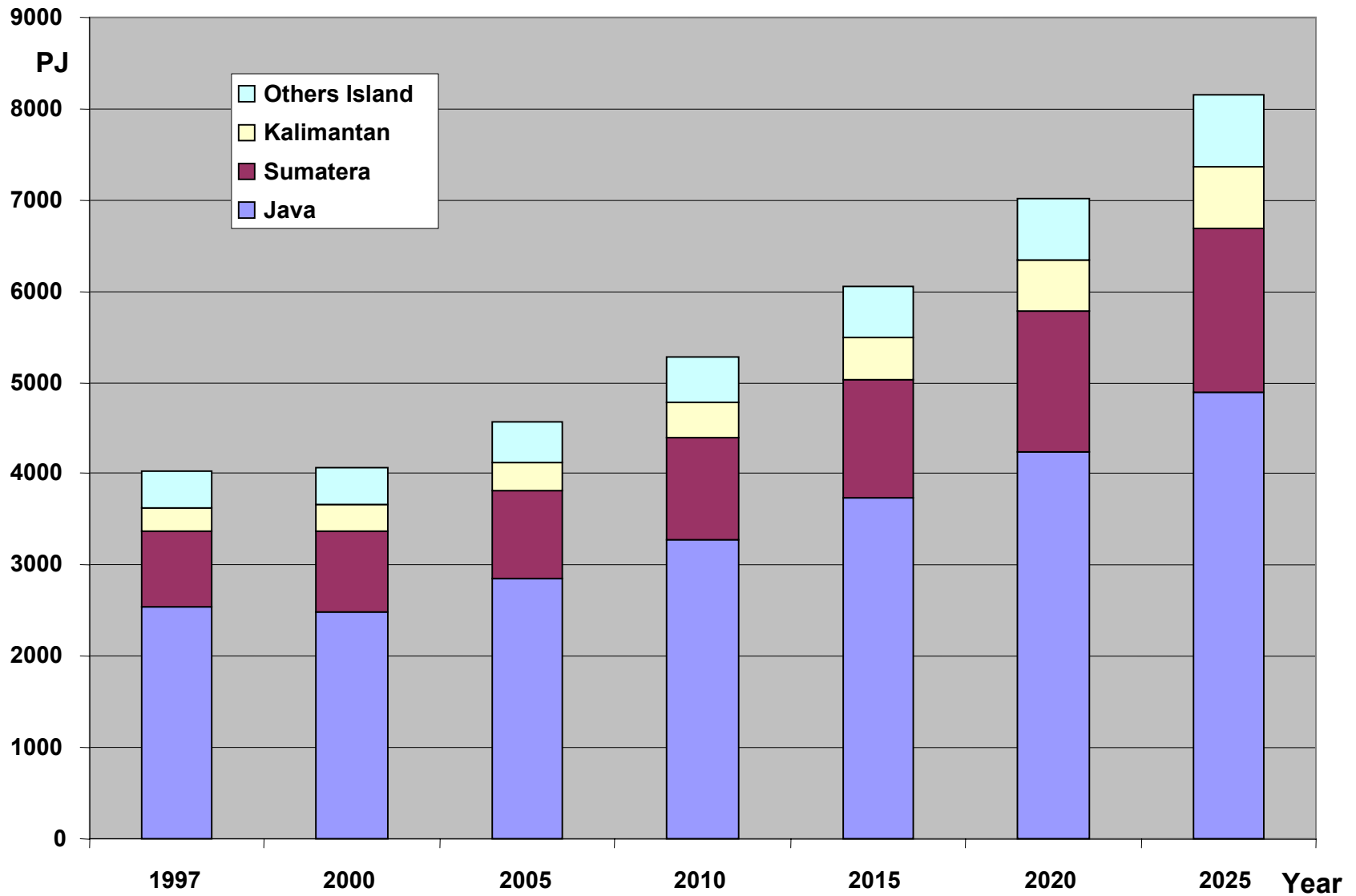


Metodologi MAED



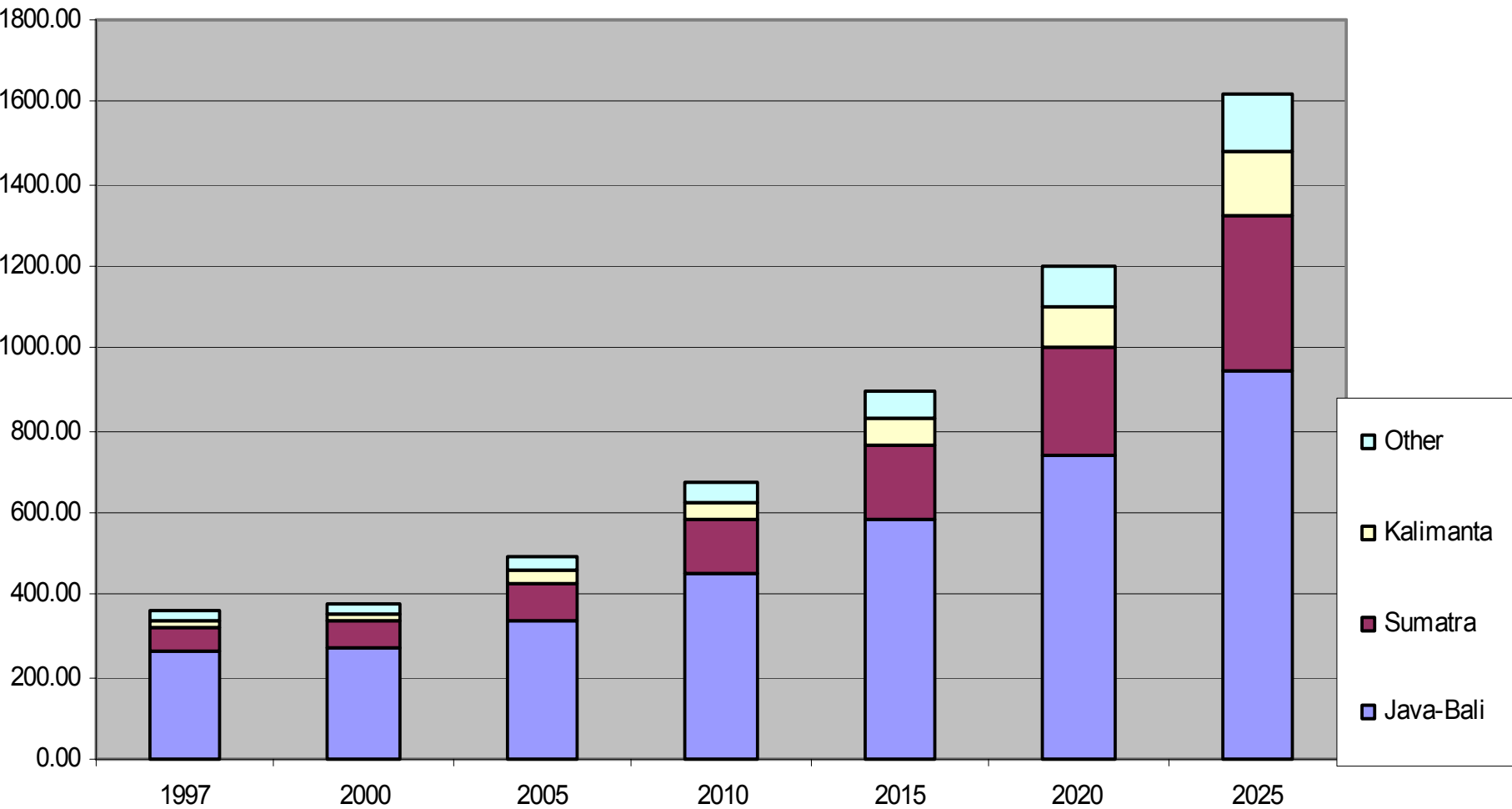


Total Energy Demand By Region





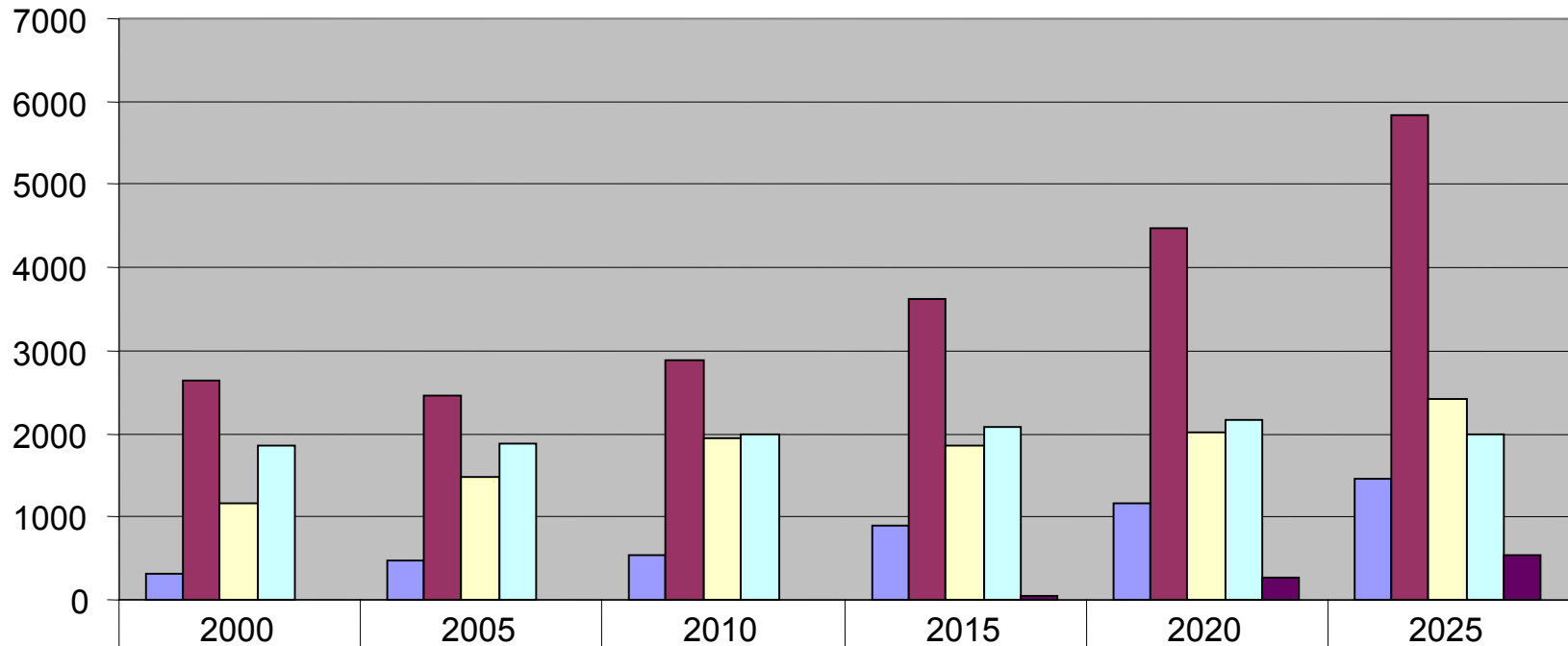
Total Electricity Demand by Region





The Results of Study

Primary Energy Supply (PJ/a) 2000-2025



	2000	2005	2010	2015	2020	2025
Coal	310	477	541	904	1158	1453
Oil	2632	2458	2889	3616	4480	5841
Gas	1168	1486	1937	1866	2014	2410
Renewable	1852	1870	1993	2088	2164	1995
Nuclear	0	0	0	36	270	530

- The NPP would be techno-economically feasible to be operated in 2015-2016 for Java Island



National Nuclear Energy Agency (BATAN)

- BATAN is responsible for research and development program in nuclear energy for peaceful utilization, also responsible for preparation of human resources and infrastructure for nuclear manpower development.
- BATAN has advocated the introduction of nuclear power in Indonesia as a part of a long term national energy system.
- To prepare manpower of the future NPP in Indonesia, BATAN has performed the Education and Training, and R&D in reactor technology, nuclear safety, fuel cycles, instrumentation and control system, and radioactive waste management.



National Research Facilities

BATAN have 3 research reactors:

1. The Triga Mark II Reactor (2000 kW) in operation since 1965 at Bandung.
2. Kartini Reactor (100 kW) in operation since 1979 at Yogyakarta.
3. The Multipurpose 30 MW Research Reactor at Serpong.





Serpong Nuclear Research Center

In order to support the nuclear energy program, several research facilities have been built in the Serpong Nuclear Research Center:

- Multipurpose Research Reactor 30 MW (MPR 30).
- Research Reactor Fuel Element Production Installation.
- Experimental Fuel Element Installation (EFEI).
- Radioactive Waste Management Installation.
- Radiometallurgy Installation (RMI).
- Reactor Safety Testing Facility.
- Informatics Development Facility.
- Nuclear Instrumentation and Design Facility.
- Hot Laboratory.



Massive Retirement & Personal Aging

- Zero growth policy in government employment (negative growth policy on BATAN employment).
- Brain-drain from public sector to private sector or industrial countries.
- BATAN employee is on decreased from 3844 persons in the year 2000 to 3596 in the mid 2004 (-6.5%).

TABLE I. Reduction number of nuclear workforce at BATAN

	2000	2001	2002	2003	2004	Sum
Pension	33	33	49	39	16	170
Pass away	7	9	17	14	4	51
Resign	20	12	11	12	2	67
T o t a l	60	54	77	65	22	288

	2004	2005	2006	2007	2008	2009	Total
Coming retirement	16	53	65	68	88	111	403



Human Resource Strategy

- Compensate the reduction number of employees with staffs promotion to have higher education programs to risings the competency and qualification of BATAN human resources.

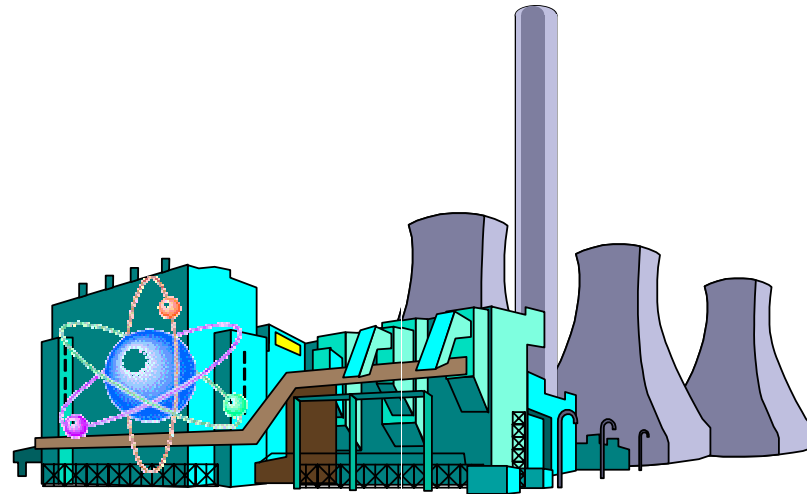
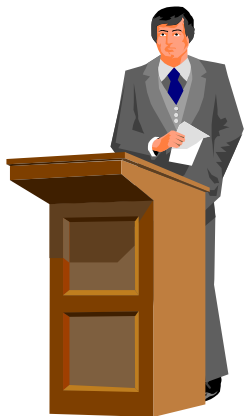
TABLE 3. BATAN Manpower Based on Education

Degree	2000	2004
Doctor	98	97
Master	233	259
Engineering	975	1004
Bachelor	502	490
Others	2025	1736
Total	3844	3596



Public Information & Public Education

- In the past, efforts to launch nuclear power programmes have failed, one of the most important reasons was due to the lack of public support because of repeated accident.
 - The first attempt in 1980 was triggered by the Three-Mile Island-2 accident.
 - the second one in 1986 due to the Chernobyl-4 accident and the crash of oil price.
 - the third one in 1997 because of the Asian economic crisis.
- The Strategy is to strengthen Public Information and Public Education Programmes.





Public Information & Public Education

How to make public understand:

- Intensify the public information in line with the dissemination of proven nuclear technology application already carried out.
- Open and transparent policy to fulfill the right to know of the public.
- Nuclear formal education lecture at schools.
- Information and education through:
 - Mass media (press releases and press interviews);
 - Interactive-live on TV and radio feature programme;
 - Seminars and workshop on nuclear energy and technology;
 - Exhibition programme (visit to the nuclear facilities).
 - Cyber programme (Web site).



Knowledge Carrier in Indonesia

Identification of Knowledge Carriers in Indonesia:

- Teachers
- Journalists
- Government Officials
- Political Leaders
- Religious Leaders and Informal Leaders
- Artists, Professional or Citizens' Groups (INS, WIN).

Evaluation:

- Experiences show that the mass media has becoming an important factor in the role of forming public opinion as well as informing and educating the people.
- Recently, BATAN has organized the nuclear science and technology training programme for Indonesian scientific journalists on September 2003.

Nuclear Knowledge Management Strategies

■ Education, Training and Qualification Personnel

The development of qualified nuclear manpower is a key driving force in realizing the success of nuclear power programme.

- Modules and References
- Knowledge Preservation and Enhancement
- Trainer.

■ National Participation

National participation is defined as the use of human resources, materials and technology resources from country in the execution of NPP project.

■ R&D and Transfer Technology

Transfer highly developed technologies from research institution to local industries for practical applications.



The Development of Training Technology

- Building and staffing of a training center for operations and maintenance personnel.
- The center should be equipped with simulator; computer aided training tools, the necessary equipment and plant mock-up for maintenance training.
- Ensuring that personnel with the necessary qualifications and experience are available for the operation and maintenance of a NPP requires.
- A well designed training programme incorporating the best international practices has to be developed and implemented at a very early stage of the nuclear power programme.



Nuclear Workforce Problem

- A few students go to the nuclear engineering field due to reduced job opportunities.
- One Department at undergraduate level teaching in Nuclear Engineering has closed due to a lack of student.

BATAN Solutions:

- Establish a school for Nuclear Engineering and expertise in Yogyakarta, namely Polytechnic Institute of Nuclear Technology.
- Promote fellowship programme to preserve and enhance nuclear knowledge.
- Sending personnel abroad to obtain Master or Doctoral degree, or for on job training (General Electric and Westinghouse companies, MEXT, etc.)



CONCLUSION

- Nuclear power is the only alternative at present for replacing the fossil base load generation, especially in Java.
- The introduction of NPP in Indonesia is not only to reach an optimum energy mix considering costs and environment, but also to relieve the pressure arising from increasing domestic demand for oil and gas.
- Comprehensive human resource development strategy is required at the beginning in planning phase, construction phase until the implementation of nuclear programme.
- BATAN has made and devoted special efforts to build a nuclear Science & Technology base in Serpong, and to prepare highly competence personnel to support our endeavor in preservation and enhancement of nuclear knowledge in Indonesia's nuclear power programme.