

SAFE OPERATION OF THE KARACHI NUCLEAR POWER PLANT (PAK/9/010) H3

MODEL PROJECT

CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US \$	US \$	US \$	m/d	US \$	m/d	US \$	US \$	US \$	US \$	US \$
1997	3/1	40,040	0	0	12/0	37,800	0/14	4,480	0	0	0	82,320
1998	3/1	42,315	0	0	12/0	39,600	0/14	4,760	0	0	0	86,675

First Year Approved: 1989

Total expenditure to 30 September 1996:

\$761,834 (TCF)
 \$51,175 (FIT)
 \$813,009 (TOTAL)

OBJECTIVES: The development objective of ensuring safe and efficient production of electricity from nuclear power creates the context for this project. Specifically, the project will address the need to enhance safety, increase the capacity and load factor, and extend the operating lifetime of the KANUPP nuclear power plant.

BACKGROUND: Pakistan is facing an acute power shortage hampering social development. Though short term power requirements could be met with the help of conventional power plants, in view of limited fossil fuel resources, the most economic long term alternative is nuclear power. Being a capital intensive alternative, a nuclear power programme has to be gradually developed, technologically and financially, for sustainable growth. The Pakistan Atomic Energy Commission (PAEC) is charged with the responsibility for this development programme. KANUPP, the first NPP in Pakistan, can be considered the launching pad for the country's nuclear power programme. It has been operating commercially for the last 23 years. The second NPP, a 300 MW(e) PWR under construction with the participation of the People's Republic of China, is scheduled for startup in 1999. KANUPP, in addition to being a relatively economical source of power, is providing a basis for gaining experience, know-how and trained personnel for the country's future nuclear power programme. There is therefore great interest in keeping this NPP operating for at least its design life and if possible beyond the year 2002. Obsolescence, ageing, prolonged isolation from the original vendors and unsatisfactory nuclear safety practices pose a serious threat to the future safe operation of the plant. The potential areas of improvement were first identified by an IAEA ASSET Mission in 1989. PAEC started a follow-up project, Safe Operation of KANUPP (SOK), with technical support under the 1991-92 IAEA TC Programme. All safety improvement tasks were identified in an Integrated Safety Review Master Plan (ISARMAP) established in 1991 under the supervision of an International Steering Committee. This Steering Committee periodically meets to discuss, categorize the safety issues, prioritize and monitor the progress of each task, in which safety/management experts from IAEA, CANDU Owners Group (COG), AECL Canada, CANDU experts from other countries, and the General Manager of KANUPP participate. The present proposal is an extension to the project approved for 1995-96. During this ongoing programme the booster cooling issue was resolved. An independent emergency feedwater system and a third standby diesel generator are being installed. Improvement of containment test pressure, and implementation of recommendations from the seismic and fire protection reviews are also in hand. Major assessments were completed on fuel channel integrity, steam generators, radiological health and safety, maintenance techniques, emergency preparedness measures, quality assurance programme, and environmental impact. A Level-1 plant specific Probabilistic Safety Assessment (PSA) is being performed by KANUPP engineers which is expected to be completed in early 1997. Necessary non-destructive testing (NDT) equipment, including an eddy current testing device, is available. Some actions to combat ageing and obsolescence have been completed and others will be extended to the present project. Some improvements in operational safety practices have been established, including an in-service inspection (ISI) programme, training in prevention and analysis of safety significant events and computerized feedback of operating experience. The safety upgrade being tackled with international participation over the last few years is expected to be completed during 1997-98 period. Funds-in-trust were provided by Pakistan.

PROJECT PLAN: *As an extension of the ongoing project, the remaining tasks will be handled in accordance with the priorities fixed by ISARMAP and reviewed periodically by the International Steering Committee. Completion of each task will be reported to the Agency. Design safety will be the most important issue. The safety analysis tasks in hand will continue under the 1997-98 TC programme. KANUPP's shutdown and emergency injection systems against large-break loss-of-coolant accident (LOCA), will be upgraded. The most visible performance indicator will be the improvement in the availability and plant capacity factors in the operation of KANUPP as a result of all the inputs received.*

NATIONAL COMMITMENT: *Since KANUPP has been in operation for about 23 years, fully fledged infrastructural facilities and engineering support are available. Adequate funds (about US \$25 million) have been earmarked by the Government for use in connection with the project Safety Operation of KANUPP (SOK). The cost will be recovered through an increase in the tariff on power generated by KANUPP, thus making the effort self-financing.*

AGENCY INPUT: *Under the 1997-98 TC programme the Agency will continue to provide expert services and training for the safe operation of KANUPP, including a reactor fuel channel inspection and replacement programme, in-service inspection, a plant operational safety surveillance programme, quality assurance, an update of the KANUPP final safety analysis report (FSAR), a fire protection review, a review of emergency operating procedures and an extension of the Level 1 PSA to include external events and Level 2 containment issues.*

PROJECT IMPACT: *Apart from revitalizing KANUPP to continue to operate with added safety, the success of the project will go a long way in establishing the technological capability to upgrade safety features of older plants to meet evolving regulatory safety standards. This will boost public confidence in the safe operation of nuclear power plants. Keeping KANUPP in operation for extended periods beyond design life will be a source of relatively low cost power from which the country will gain economic benefits.*