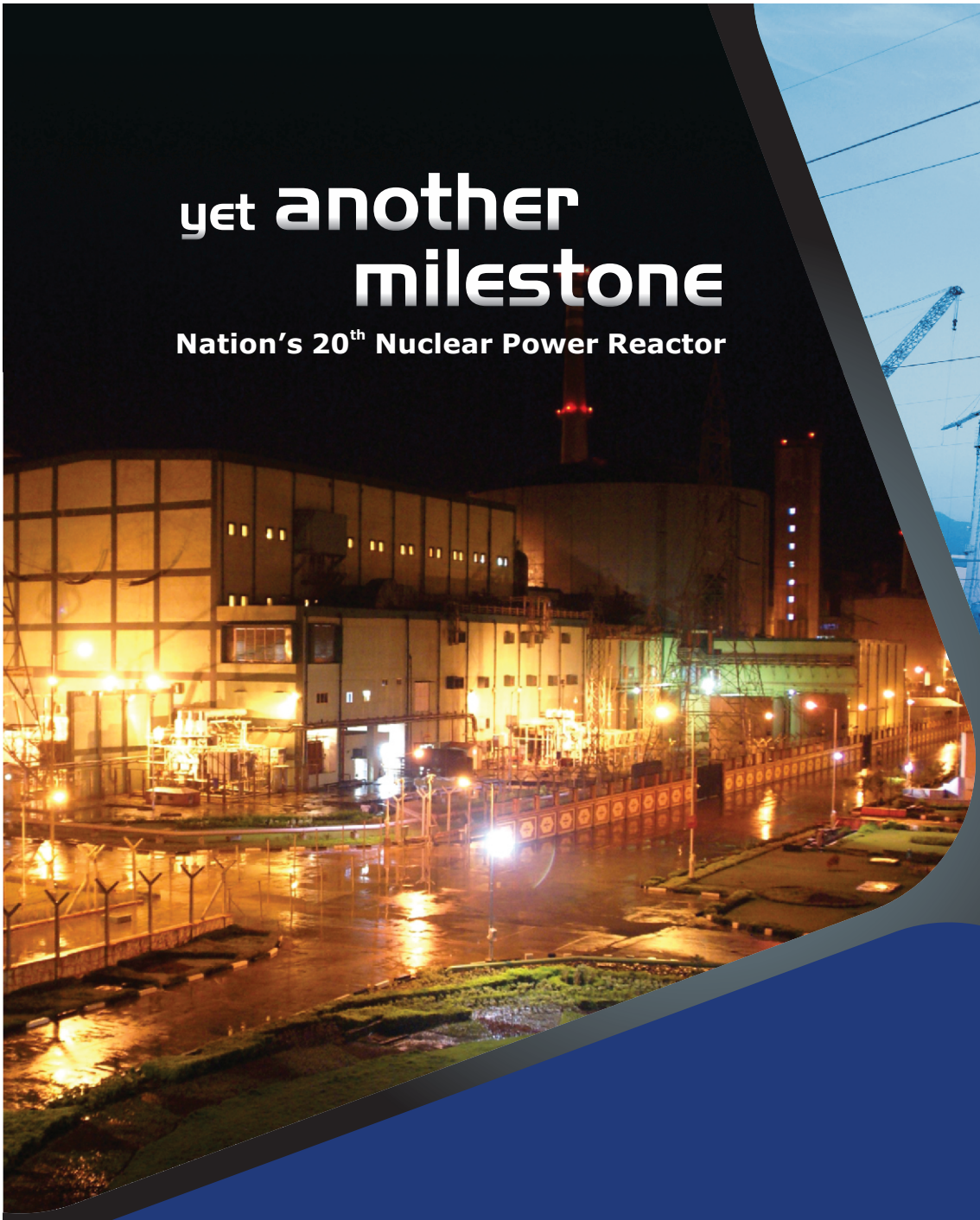
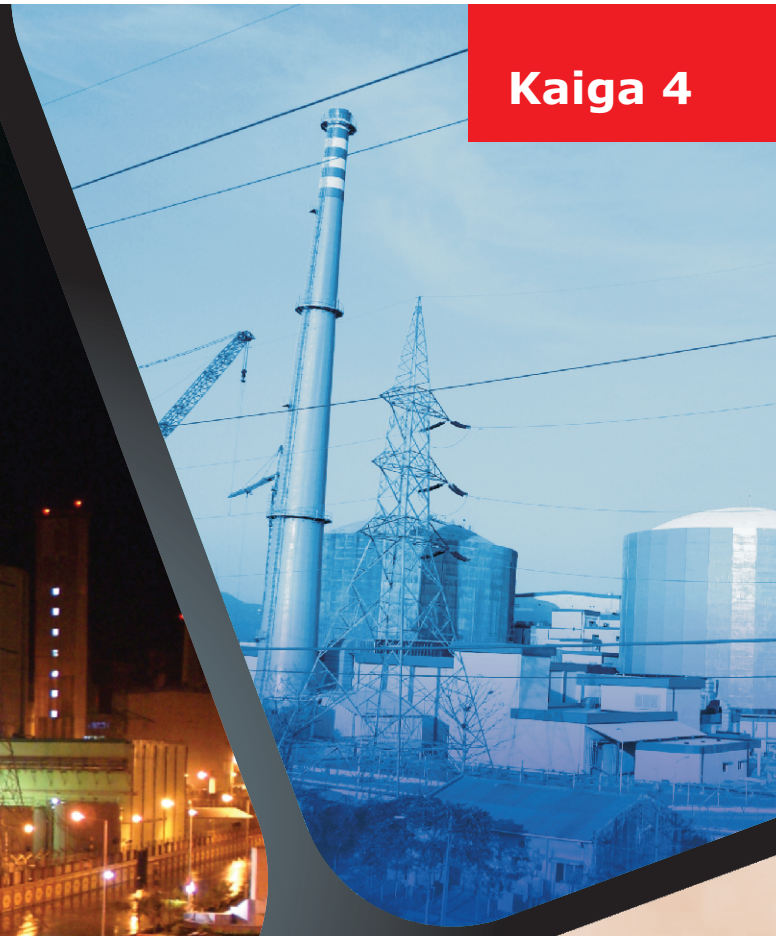
Kaiga 4

yet another milestone

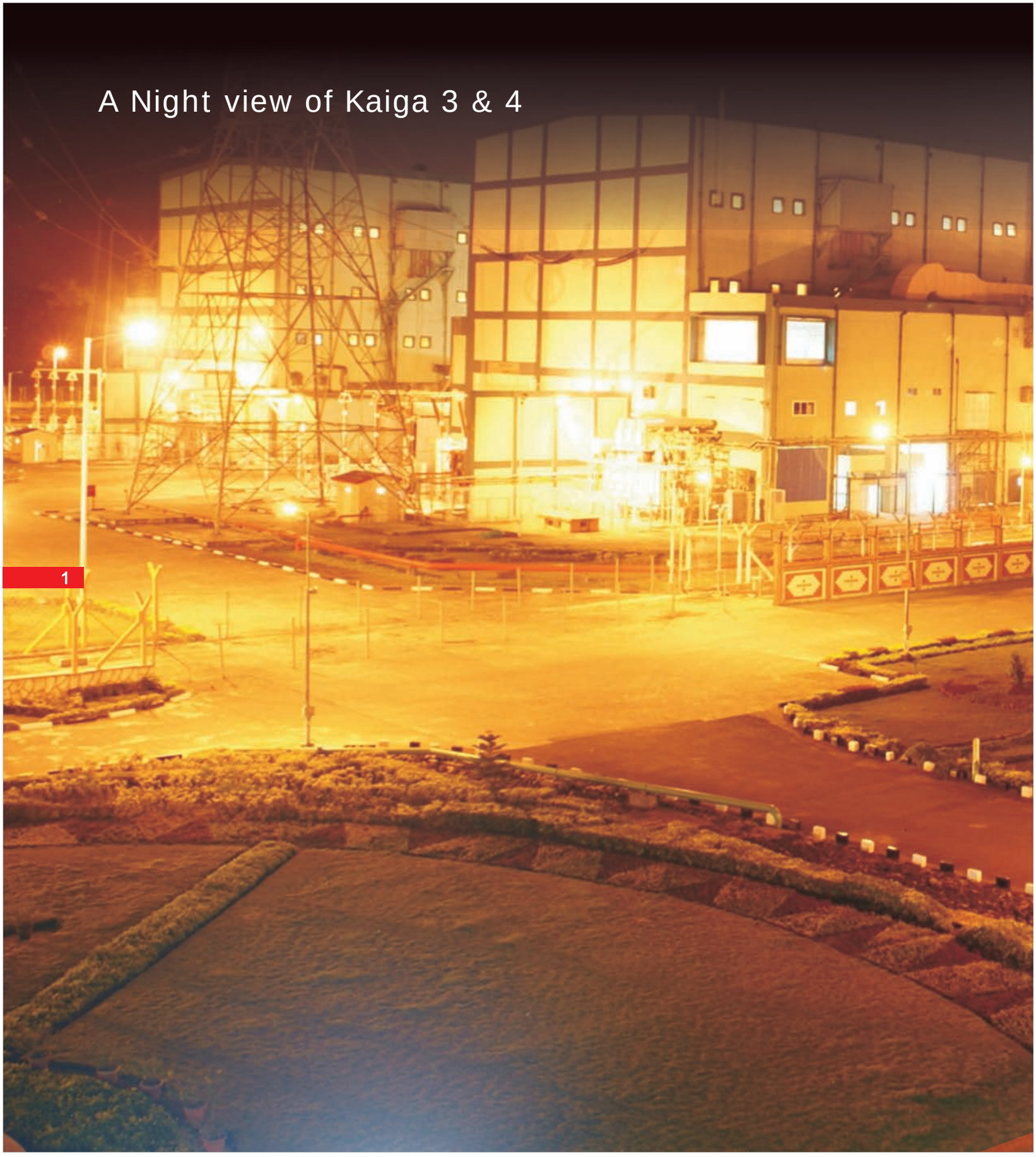
Nation's 20th Nuclear Power Reactor



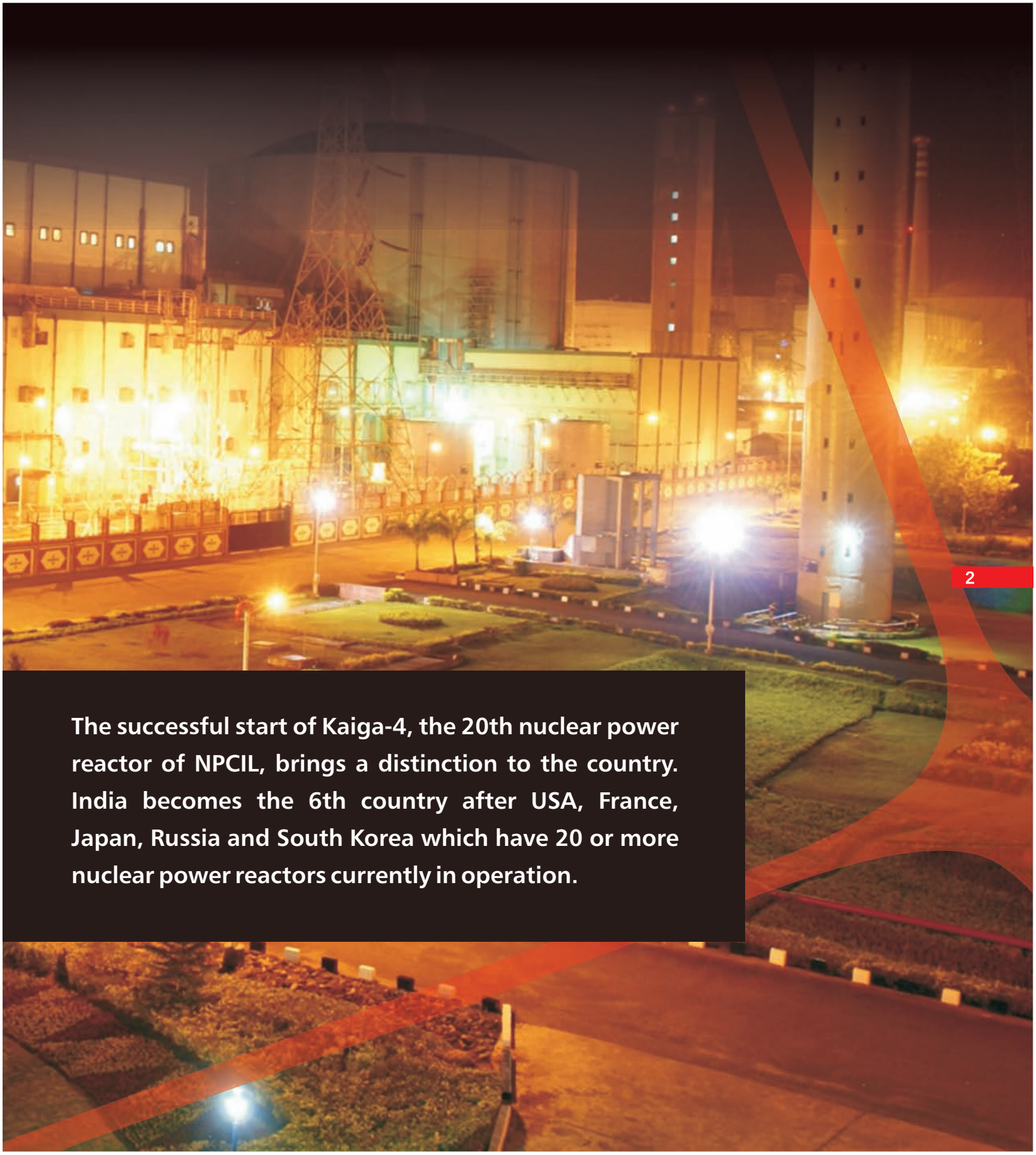


एनपीसीआईएल
NPCIL

NUCLEAR POWER CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

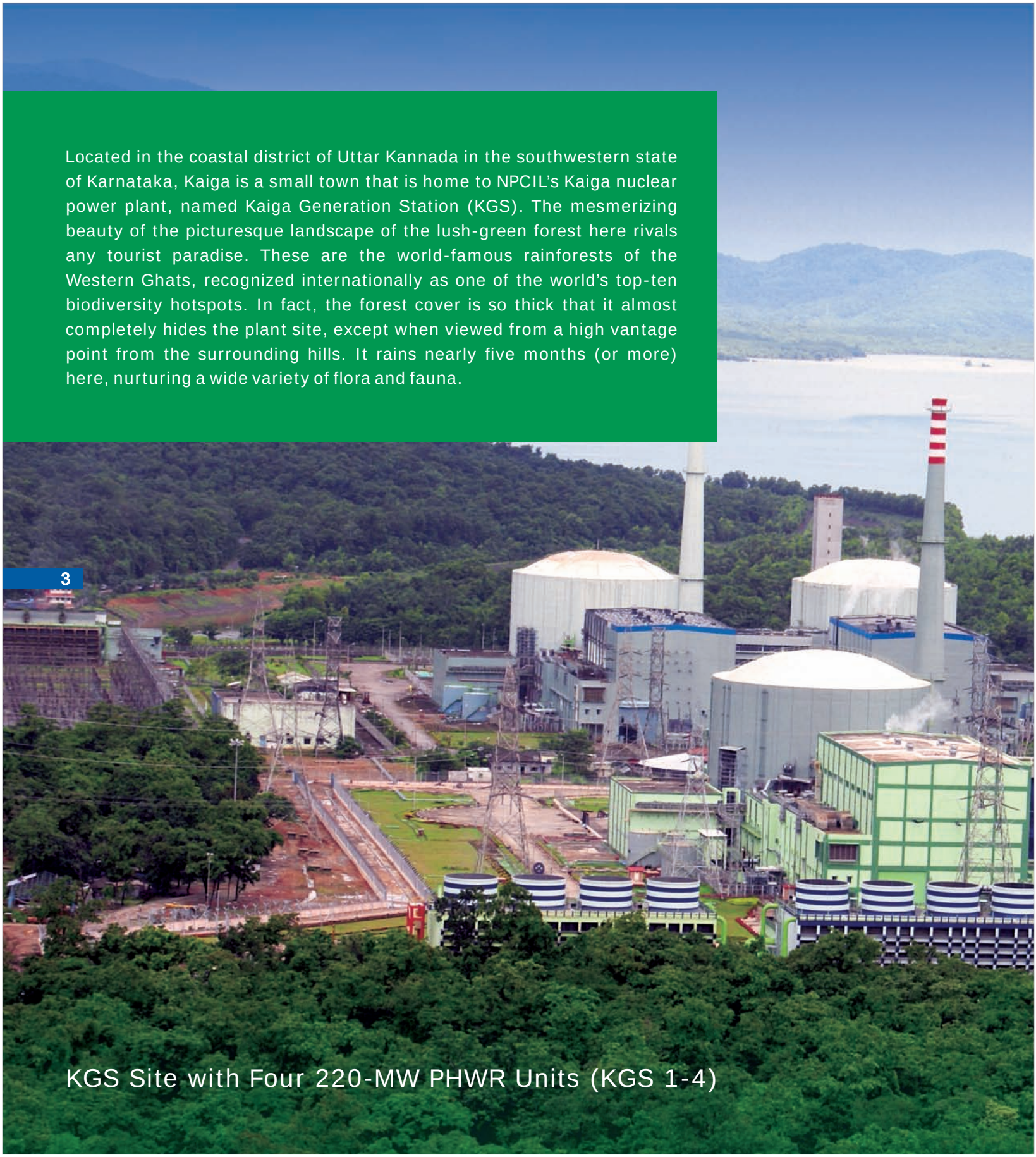


A Night view of Kaiga 3 & 4



The successful start of Kaiga-4, the 20th nuclear power reactor of NPCIL, brings a distinction to the country. India becomes the 6th country after USA, France, Japan, Russia and South Korea which have 20 or more nuclear power reactors currently in operation.

Located in the coastal district of Uttar Kannada in the southwestern state of Karnataka, Kaiga is a small town that is home to NPCIL's Kaiga nuclear power plant, named Kaiga Generation Station (KGS). The mesmerizing beauty of the picturesque landscape of the lush-green forest here rivals any tourist paradise. These are the world-famous rainforests of the Western Ghats, recognized internationally as one of the world's top-ten biodiversity hotspots. In fact, the forest cover is so thick that it almost completely hides the plant site, except when viewed from a high vantage point from the surrounding hills. It rains nearly five months (or more) here, nurturing a wide variety of flora and fauna.



KGS Site with Four 220-MW PHWR Units (KGS 1-4)

Kaiga – In Perfect Harmony with Nature

Indeed, Kaiga truly represents a perfect blend of technology and nature.

Kaiga village is about 55 kilometers from the town of Karwar, which is the nearest railway station on the Konkan Railway's Mumbai-Mangalore route. The Kaiga plant site is located 12 kilometers away on the left bank of river Kali, upstream of Kadra dam. This region of Karnataka is very close to the neighbouring state of Goa, and in fact, the nearest airport is Dabolim at Vasco-da-Gamma in Goa, about 150 kilometers from the plant site.

Kaiga-4 Elevates India to 6th Rank in the World

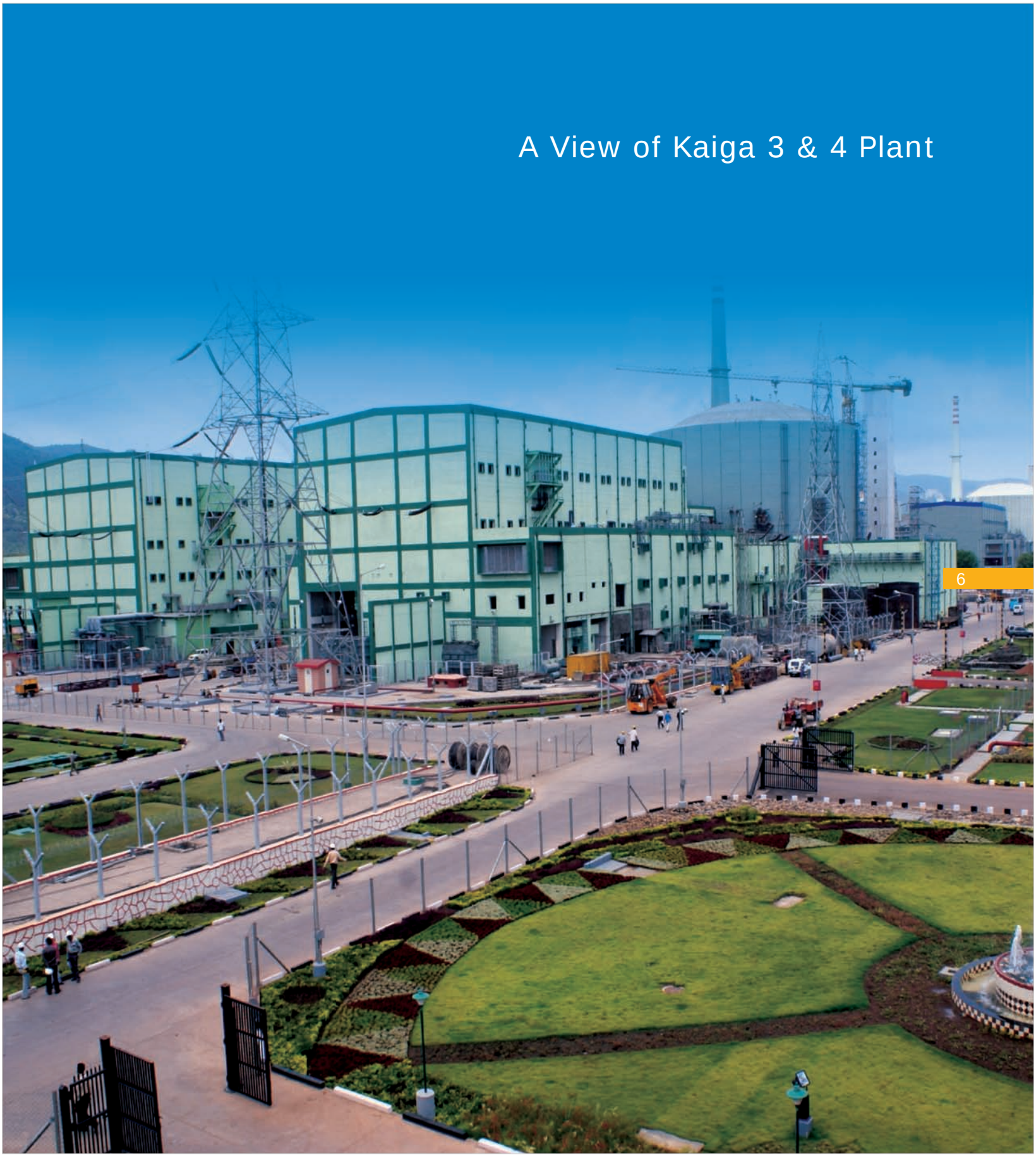
Kaiga-4, India's 20th nuclear power reactor, brings a remarkable distinction to the country as India becomes the 6th country after USA, France, Japan, Russia and South Korea to have 20 or more nuclear power reactors currently in operation.

Kaiga-4 has raised the installed capacity at Kaiga site to 880 MW, the third-largest site of NPCIL, after Tarapur and Rawatbhata.

Kaiga is NPCIL's sixth nuclear power plant (NPP) site (of a total of 7 plant sites and 20 nuclear reactor units). The first two nuclear reactor units (KGS-1&2) at the plant site have been operating safely and reliably since the year 2000, while setting new records in performance as benchmarked against other PHWRs of its class globally.

The third unit at Kaiga, KGS-3, attained 'first criticality' in February 2007, in a record time of 59 months (less than 5 years) from the first pour of concrete (i.e., zero date). Meanwhile, work progressed rapidly on the fourth unit (KGS-4), which completed PHT hot conditioning in the stipulated time. **With KGS-4, NPCIL now has a fleet of 20 nuclear reactor units at 7 plant locations across the country.** All the four PHWR units at Kaiga are indigenously designed.

A View of Kaiga 3 & 4 Plant



The Kaiga PHWR – An Engineering Marvel

The design of the nuclear reactor units 3&4 of Kaiga Generating Station (KGS 3&4, also called Kaiga 3&4) is conceptually similar to its predecessor 220-MW PHWRs (KGS 1&2). NPCIL's operating experience of over 325 reactor-years, including that of latest reactor unit, 540-MW PHWRs at TAPS-3&4 and the international industry experience and best practices have been implemented in the making of this engineering marvel. State-of-the-art control systems have been introduced and several other component-level as well as equipment-level improvements have also been implemented to bring in contemporariness in features as well as to ensure greater ease of construction of the project.


Control Room

The reactors are horizontal cylindrical vessels, constructed out of Stainless Steel-304L with horizontal coolant channels of Zirconium–2.5% Niobium, containing fuel bundles. The reactors use natural uranium oxide fuel bundles. Heavy water is used both as moderator and primary coolant, primarily to have neutron economy.

Each unit has four steam generators, vertical shell tube type and have the latest state-of-art design features such as sludge lancing, in-service inspection (ISI) facilities, etc. Each steam generator employs about 1850 Incalloy-800 tubes – one of the most robust and proven material for such duty. The steam generated in these steam generators is fed to saturated steam turbines, the prime mover for generation of electricity. The steam is condensed in the condenser after driving the turbines and the condensate is pumped back to steam generators through a train of feed-water heaters, as done in any other conventional power plant using steam.

The plant design employs the philosophy of redundancy in safety equipment, defense-in-depth principle, diversity in detection and control, and fail-safe philosophy for the safety-related equipment. Each unit has two independent and diverse shutdown systems and has a poison-addition system, for long-term sub-criticality. The reactor is controlled by the control rods located at the top of the vessel. These rods are operated through a computerized reactor control system, which is entirely independent of the shutdown system.

Each reactor is housed in its primary containment, while a secondary containment envelops the primary containment. The annular space between the two containments is kept at a negative pressure with a filtration and pump-back system to ensure zero ground release in the worst case scenario of a ‘design basis’ and ‘beyond design basis’ accident. The radiological safety is further enhanced by adopting 'zero discharge' concept. The heat removal from the moderator and reactor auxiliary systems is done by an independent closed-loop

Construction of RB in full Swing

A View of Primary System Piping

cooling water loop, which, in turn, is cooled by a tertiary closed-loop cooling system, employing induced draft cooling towers, for dissipating heat to environment. All the radioactive cooling water systems have two barriers, and thus, radioactivity leak cannot occur unless there is a simultaneous failure of both the barriers, which is very unlikely. The leak detection systems can detect the incipient leak on failure of first barrier itself, and thus, zero-discharge concept is met. All these engineered safety measures, verified and validated by the latest techniques, will ensure safety of the public and surrounding environment in an unlikely nuclear accident.

A View of Completed Field Instrumentation Panels

Overcoming of
the Site - Specific Challenges

Kaiga's 4000 mm average annual rainfall spread over 4½ months

The most formidable challenge for the Kaiga project came from a very unlikely source – the 4000 mm of torrential rain that lashes the project site for at least 4½ months in a year.

The project site is located amid a dense evergreen rainforest of the world-famous Western Ghats. And believe it or not, this lengthy and heavy monsoon season is the one single factor that changes the game so radically here compared to all 'other' NPCIL plant sites that an entire gamut of novel initiatives had to be implemented in order to overcome its pace-reducing impact on the project's progress – from the start of excavation to the completion of roof pours for all main plant buildings – and indeed its overall impact on the project completion time.

Among the several steps taken for effectively meeting this 'formidable' challenge, one was to pre-fabricate several structural elements off-site, which helped in shifting a significant amount of work indoors. This not only provided the working teams a much-needed relief, but also this modular approach speeded up construction activities as a result of "parallel" workings. This multitasking drastically reduced manpower fatigue, saved time and reduced wastage, and thus also proved cost-effective.

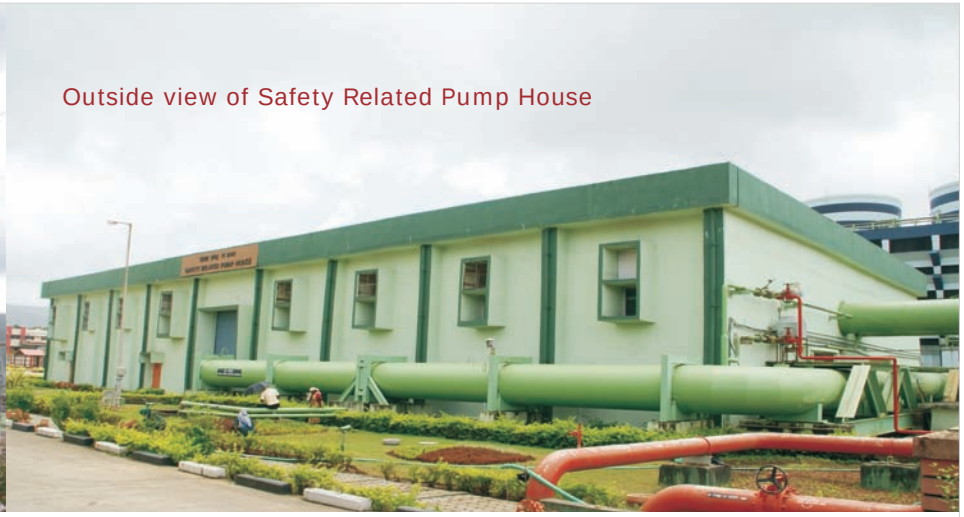
Yet another major innovation devised in this regard was the construction of a large overhead canopy over the reactor building that provided an effective shelter for doing on-site work. The canopy protected key work areas from the direct impact of the lashing rains, and made possible round-the-clock working even under heavy precipitation.

Practically, these novel time-saving and multitasking measures were very effective, because they helped in pulling forward the entire project timeline, which in turn allowed the project to be completed in a much shorter time period than would have been possible otherwise. And when push came to shove, the results were there for everyone to see. Indeed, Kaiga 3 was completed in a record time of less than 5 years (59 months).

Canopy During Constructiobn

Complexity No Bar

Constructing a nuclear power plant is a huge and intricate exercise in project planning and logistics. The integration of engineering, procurement, and execution need to be done at every stage. This is essentially done by meticulous planning and review process through an iterative process. In addition, there are many teams – both internal and external – in the form of various agencies, engineering, design, procurement, equipment manufacturing and supplies, contractors and the regulators. All of them have to work in a military-like unison in order to achieve work targets on schedule, while delivering highest standards of quality and consistency in a timely manner. This is quite a challenge. But when you have dedicated people working with utmost precision, enthusiasm and professionalism, complexity is really no bar. To give an idea of the scale and complexity of some of the works undertaken in Kaiga 3&4 project, here is an overview:



Outside view of Safety Related Pump House

Quantum of Works – An Overview of Complexity

Sr. No.	Item	Quantity
01	Tunnels and Trenches	3.3 km
02	Concreting	3,10,600 m^3
03	Reinforcement	2,00,000 MT
04	Structural Steel	26,500 MT
05	Ventilation Ducting	25,000 m^2
06	Pipe Welding	2,80,000 inch-diameter
07	Pipe Erection	3,40,000 inch-meter
08	Tubing	186 km
09	Cabling	1,930 km
10	Conduiting	203 km
11	Instruments	165000 Nos.
12	Light Channel	30 km
13	Cable Tray	107 km
14	Wire Termination	1,10,000 Nos.

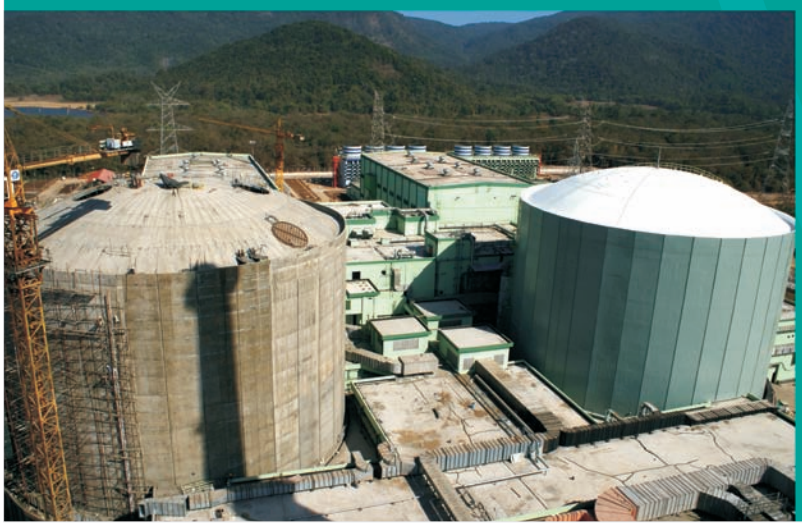
Achievements of Critical Acclaim for Kaiga 3 & 4

Activity	Kaiga-3	Kaiga-4
Calandria tube installation	16 days	19 days
Coolant tube installation	28 days	24 days
PHT hot conditioning	55 hours	62 hours
IC dome concreting	78 days	34 days
COIS installation, testing and commissioning	35 days	10 days

Innovative Project Management

Project Management is the equivalent of a central nervous system in any mega project, and especially for a nuclear power project, where it involves managing overlapping work areas and multiple working teams – departmental as well contractors' – on a day-to-day basis, not to mention the multidisciplinary nature of the jobs, staggering technological complexity, highly demanding specifications, and tight deadlines.

Yet another dimension of the responsibilities of Project Management is training of the workforce, as there is a significant proportion of the workforce that is roped in from the surrounding areas. This local workforce is often minimally literate. Structured training and pre-job briefings on the safety aspects, intricacies of the works and the procedures to these persons and their supervisors is a priority in nuclear power plants essentially to achieve the objectives. This is no small exercise by any means. Therefore, the role of Project Management is indeed subtle as well as intense at the very same time. This might seem like a literary contradiction, but that really is the case! Sophisticated planning is the name of the game.



A view of Secondary Cycle Piping

And in a project of this scale and complexity, there are more challenges lurking at every nook and cranny than meets the eye. The logistics are truly overwhelming, to say the least.

Indeed, it is the Project Management team that shoulders the ultimate responsibility for guiding the mind-boggling juggernaut of 8000 to 10,000 workmen at its peak. For this, the PM team has to feel every beat and pulse of the confounding operations of setting up a nuclear power plant – A to Z – and all this has to be achieved pretty much within the overall constrains of time and cost.

To achieve this mammoth task, the PM team has to be innovative as well as agile – sniffing any and all potential bottlenecks well in advance, while deploying the best possible set of solutions to steer clear of any possible hurdles – finally to emerge triumphant, and also in the process, making the nation proud.

The Kaiga 3&4 Project Management team adopted many innovative methods and methodologies to achieve a performance par excellence – from the pre-project phase to project completion phase.

Some of the innovative methodologies adopted at Kaiga include:

Pre-Project Phase

- Established Kaiga 3&4 Security Office with computerized access control for contractors' personnel and materials to minimize delays at the entry gate and to ensure improved security with strict vigil on contractors' manpower deployment and supplies on day-to-day basis. Adopted paperless functioning in contract management with availability of project-related documents/drawings in soft form on project intranet and implementation of Works Contract Management System (WCMS) for e-processing of contract billing and joint field measurements

- Deployed knowledgeable and experienced optimal team for project management and thus executed the project construction with minimum departmental workforce

- Arrived at a base line for the project construction by working out on WBS and resources required thereof

- Developed good basic facilities, viz., roads, water supply, electrical supply and communication in contractors' facilities areas and contractors' labour colony in the beginning itself

- Developed and instituted a unique Project QA Manual and a Safety Manual for the Erection activities,essentially to provide guidelines in clear and unmistakable terms. Structured and systematic brain storming deliberations on future work plan and geared up erection team for proper sequencing of erection activities to avoid mutual interferences, damages to the erected works, and resultant re-works with a motto "Do it right the first time"

A Night View of Construction

Project Erection Phase

- Enforced training cells under each mega project contractor and ensured indoctrination of contract manpower prior to actual deployment at work
- Ensured excellent initial mobilization by the contractors in terms of facilities, equipments & machinery, and manpower
- Adopted fast-tracking and phased construction wherein project design and construction were accomplished in overlapping manner, thus realizing a considerable reduction in the total construction time of the project, which was a record for NPCIL
- The work was undertaken 24x7 in all the critical areas, with planning and phased deployment of resources and human capital
- Strategized on pre-fabrication and pre-assembly in shops and then shifted the finished/semi-finished assemblies/components to the location and thus minimized on-field work, ensuring excellent workmanship and conformance to QA stipulations
- Minimized material wastage by working strictly on cutting schedules for pipes, cables and tubes
- Ensuring timely Supply-chain lineup was considered a critical area, and hence this was focused on a microscopic level. This helped in the availability of equipment and components as planned
- Strategically intervened to salvage the contracts running behind schedule
- Demonstrated quick decision-making in addressing technical, contractual and financial issues that cropped up during the progression of the project

Steam Generator Being Taken Inside the RB-4 for Erection

- Installed an all-weather canopy over reactor buildings for ensuring all-weather construction and round-the-clock working
- Effective use of computerized Project monitoring and Management for timely analysis and effecting appropriate mid-course corrections.And Some of The other Achievements...
- Received 'Excellent' MOU rating for two years, (2005-06 and 2007-08)
- Ensured 100% yearly budget utilization consistently over the entire construction period

Project Phase – The Lessons Learnt

All the lessons learnt have been well documented for future use.

Civil Construction

The Innovative Approach in Civil Construction

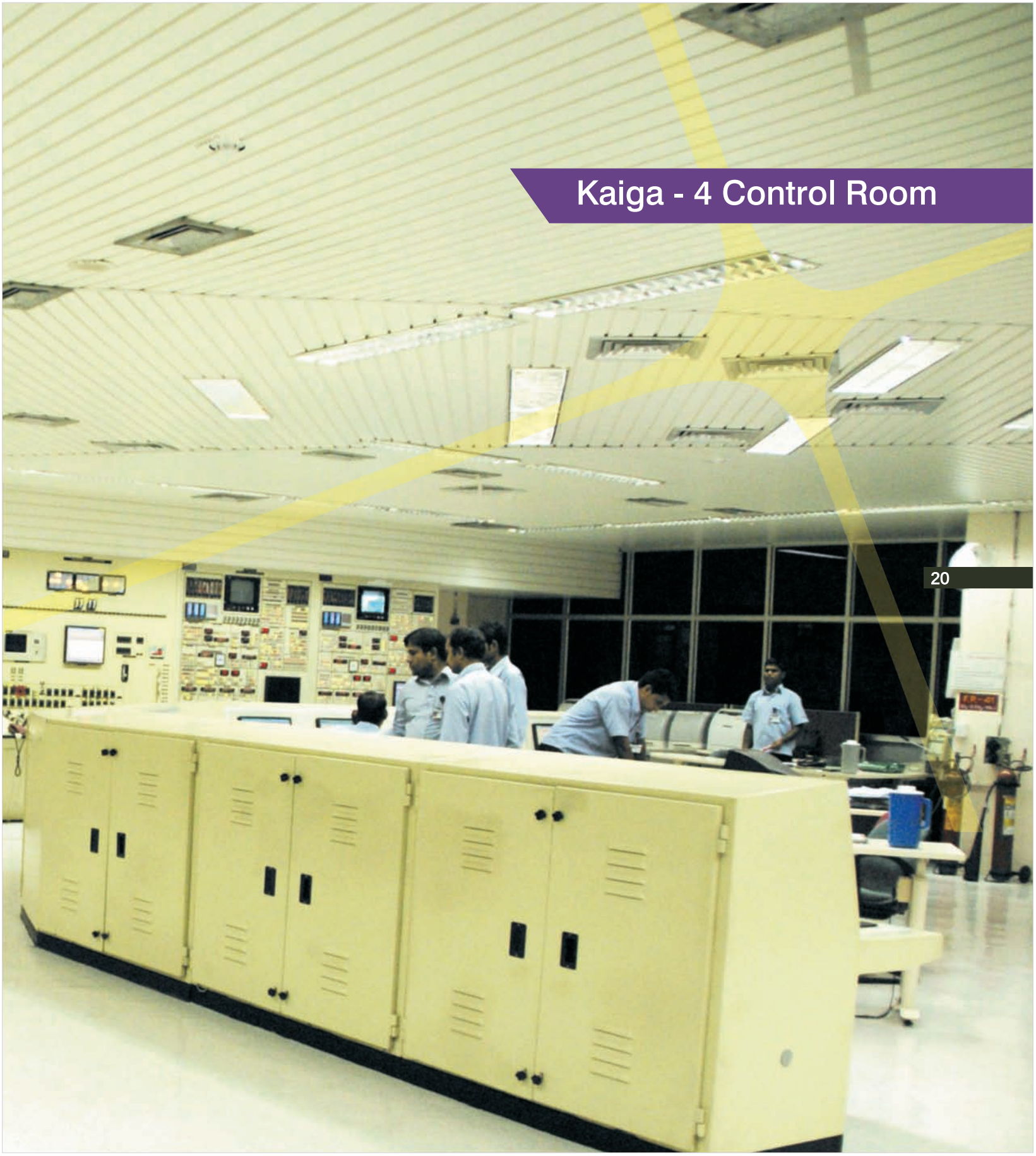
- Using an all-weather canopy structure on RB for ensuring all-weather construction provided uninterrupted construction even during heavy monsoon spread over 4 months or longer
- Using threaded couplers for joining reinforcement rods provided faster erection of reinforcement modules
- Pumping of heavy concrete directly to the pours provided faster concreting and better quality control
- Open-top construction and parallel working facilitated simultaneous erection of equipment, accelerating the project schedules
- Developing and using self-compacting concrete (SCC) to facilitate easy placement of concrete, especially in dense reinforcement and for high-rise column pours
- Maximizing pre-fabrication resulted in savings of time and efforts and allowed in situ construction and erection with enhanced quality
- Using high mast light facilitated round-the-clock and safe working, and also helped completion of project activities in time
- Qualifying critical design structures for constructability through full-scale sectional mockups, ensured the right results the first time, thus saving time in actual construction and allowing greater assurance of Quality

Qualifying critical design structures for constructability through full-scale sectional mockups, ensured the right results the first time, thus saving time in actual construction and allowing greater assurance of Quality.

A View of IC Dome on Completion of All the Pours

Deployment of Major Plant & Machinery

Sl. No.	Equipment	Deployment at peak
01	Tower cranes	10 Nos.
02	Transit mixer	15 Nos.
03	Batching plant	2 Nos. (one of 80 m3 and another of 40 m^3 capacity)
04	Ice plant	1 No. (200 Te storage capacity with 25 TPD x 2 production rate + one of 25 TPD as stand- by)
05	Concrete pump	3 Nos. (each of 50 m^3 capacity)
06	Mobile crane	1 No. (of 30-Te capacity)
07	Placer boom	1 No. (35 m^3/hr rating)
08	Air compressor	5 Nos. (of 700 cubic ft/hr rating)
09	Trailers	1 No. (of 20-Te capacity)
10	Welding generator sets	25 Nos.
11	Crushing plant	1 No. (of 200 Te/hr production capacity)
12	Bar shearing machine	2 Nos.
13	Bar bending machine	2 Nos.

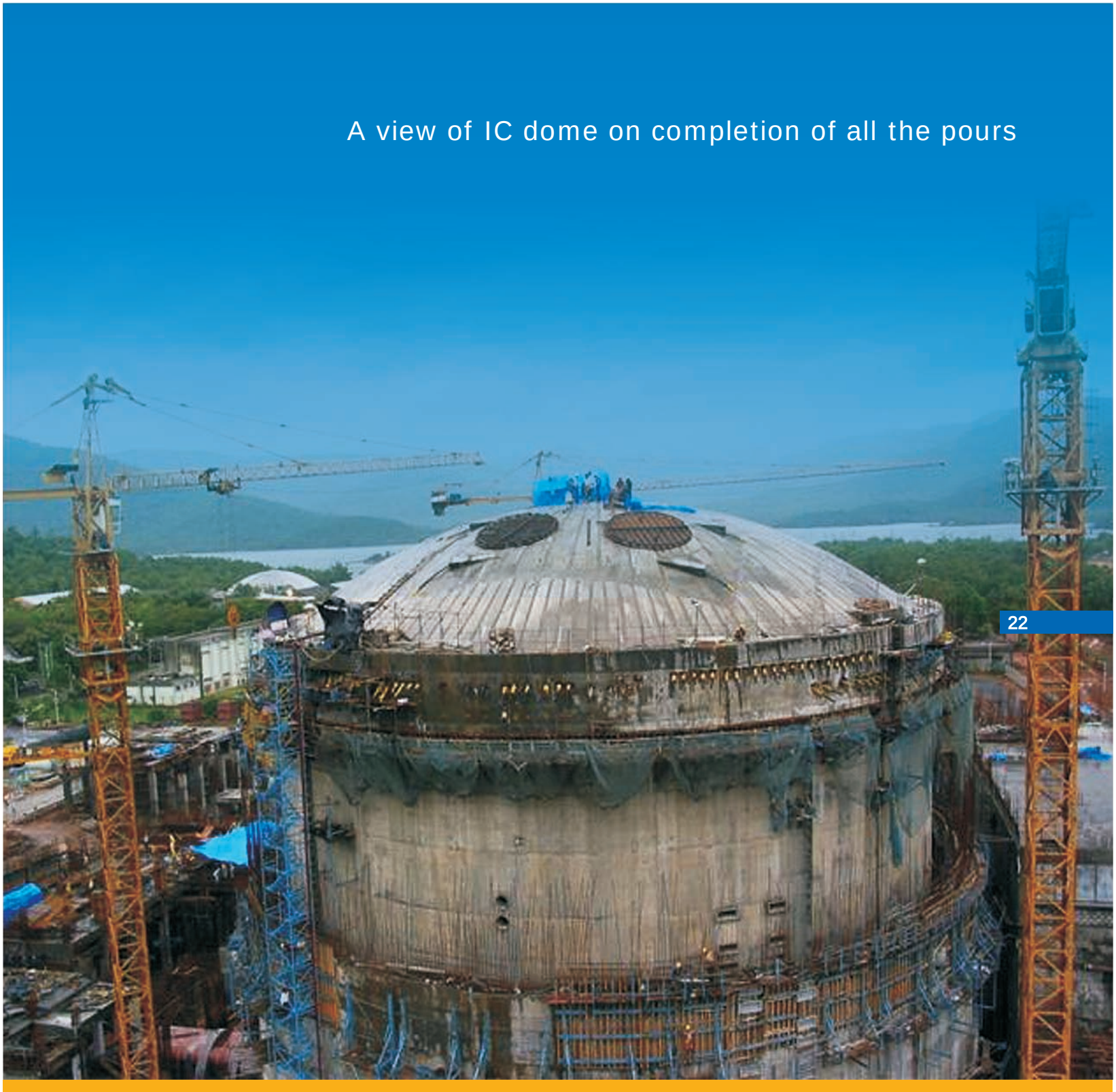


Kaiga - 4 Control Room

Highlights of Civil Construction

- Adopted modular construction for Calandria and Fuelling Machine vault which saved time. Resulting in release of calandria vault and fuelling machine (F/M) vault for end-shield erection in a record time of 14 months
- Casting of walls and columns of 5-m height in a single pour –Increased pour height of IC wall from 2.16 m to 3.5 m
- Casting of RB raft in 8 pours against the 64 pours in Kaiga 1&2
- IC dome shuttering was fabricated, ground-assembled and shifted to the location to save time
- RB-4 dome was cast in peak monsoon with full proof rain protection
- IC dome concreting of Unit-3 completed in 78 days and Unit-4 in record time of 34 days (Pour sequence changed for Unit-4)
- Integrated leak-rate test (ILRT)-cum-proof test of both the units completed successfully
- TG deck was cast in a single pour (783 m^3)
- D_20 tower structure prefabricated and installed in situ
- Highest Concreting of 11866 m^3 was achievedin the month of January 2005., A total of 310573 m^3 of concreting was done for Kaiga 3&4 units
- All safety-related tunnels and pipe trenches were constructed reaching out to hard-rock level, which was 3-5 m below the estimated datum specified in the design, and thus additional concreting equivalent to one floor was done before arriving at the specified datum of the tunnel and trenches, putting enormous pressure on time and cost

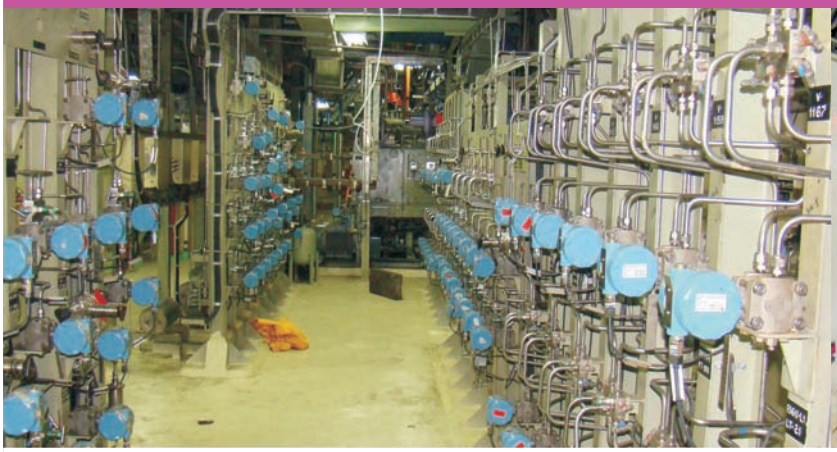
A view of IC dome on completion of all the pours



Control & Instrumentation (C&I)

Control & Instrumentation (C&I) is undoubtedly the equivalent of a perfect blend of a doctor's stethoscope in one direction and a remote control in another. In other words, C&I systems provide highly sophisticated human–machine interface.Safe, reliable and efficient operation of a nuclear power plant depends vitally on precise controlling of various parameters, which have intimate relationship with the specific functioning of the various systems in particular, and the plant as a whole.

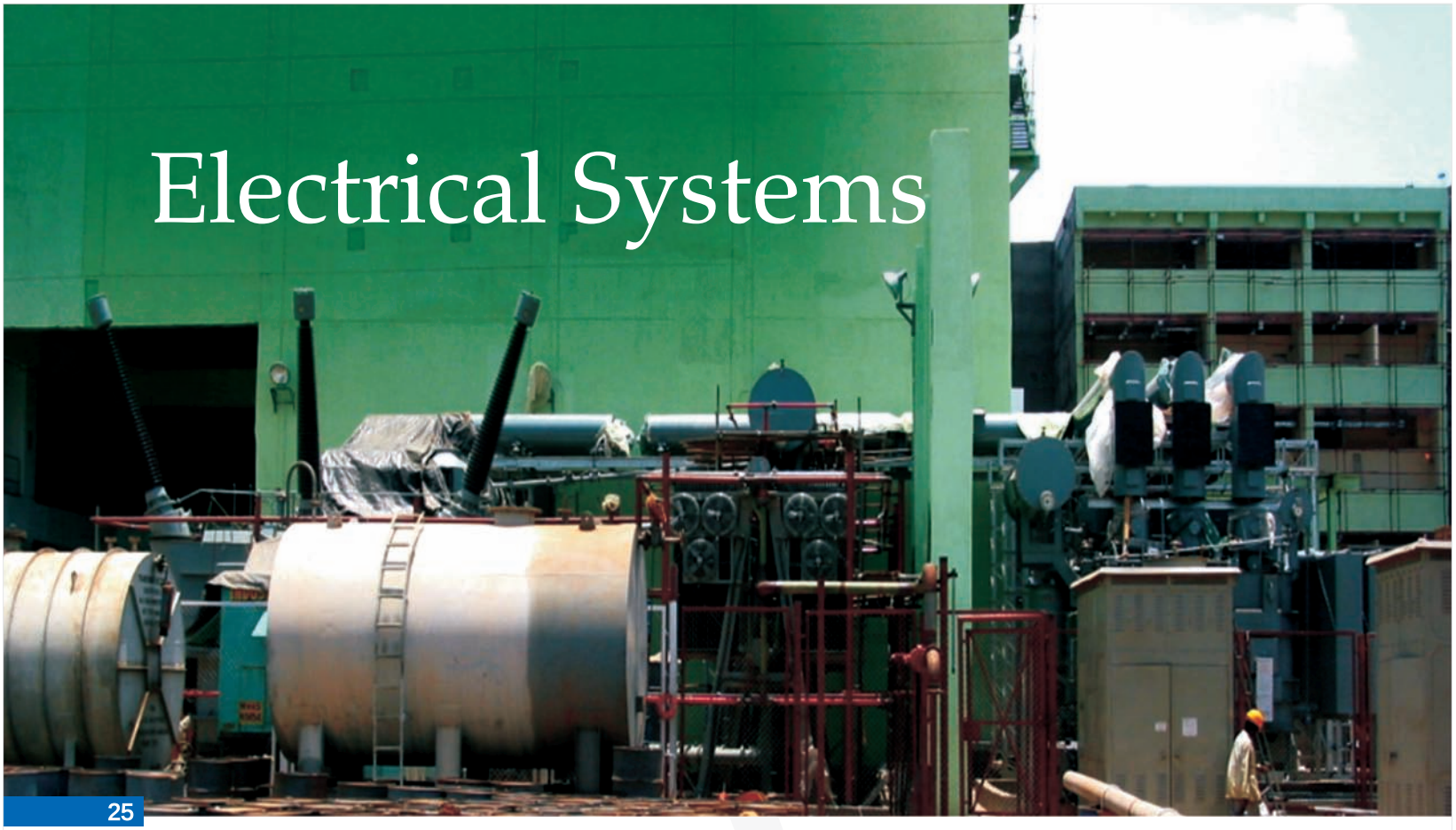
A View of Completed Field Instrumentation Panels



A View of Control Room

Highlights of C&I

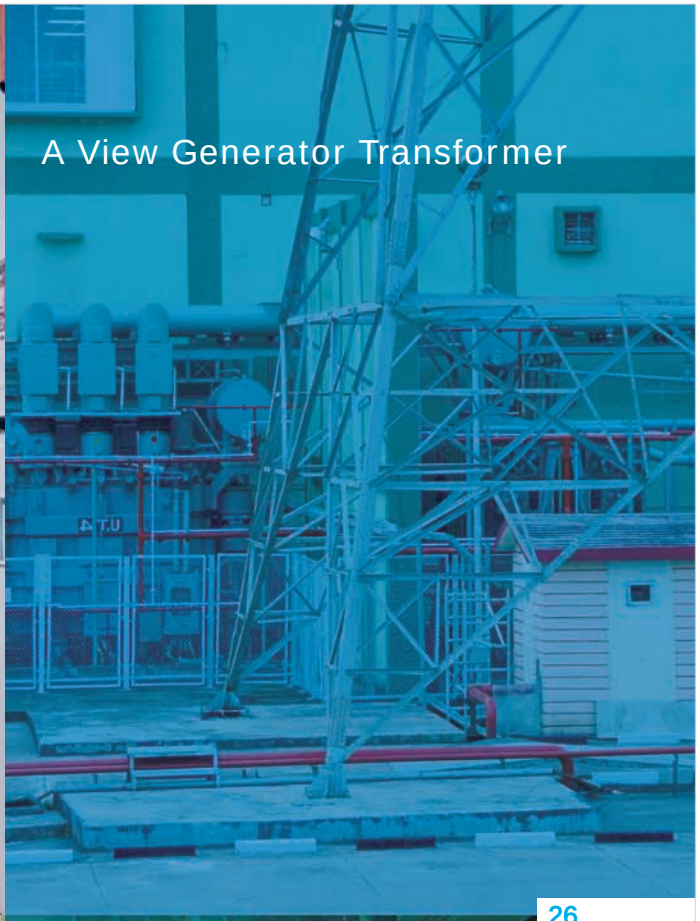
- C&I work was pursued in a fast-tracking manner, as C&I design and construction overlapped pretty tightly. Field instrumentation mega package was the first major contract concluded in shortest possible time
- The COIS (Computerized Operator Information System) was installed and commissioned within a very short duration, which facilitated the commissioning of field equipment/systems directly from the control room in the very first attempt, doing away with temporary wiring for local switches, saving time, effort and money
- Control battery banks were installed, tested and commissioned at the very early stage of the project along with control UPSs, which facilitated initial powering of systems, control loops and equipment in permanent manner
- All sensors (embedded as well as installed ones) including surface-mounted strain gauges and dial gauges were commissioned and were functioning during the ILRT-cum-proof test of RB-4. . This feat also found special mention in the report issued by Atomic Energy Regulatory Board (AERB)
- Control room works were completed in an aggressive time schedule, Anti-static flooring with improved entrance matting system was done for the first time in the Kaiga 3&4 control room
- Physical protection system was completed in two months, adopting innovative methods of execution. The outer fence on the north side of the plant was re-designed to facilitate 650-Te crane movement without dismantling the outer fence



Electrical Systems

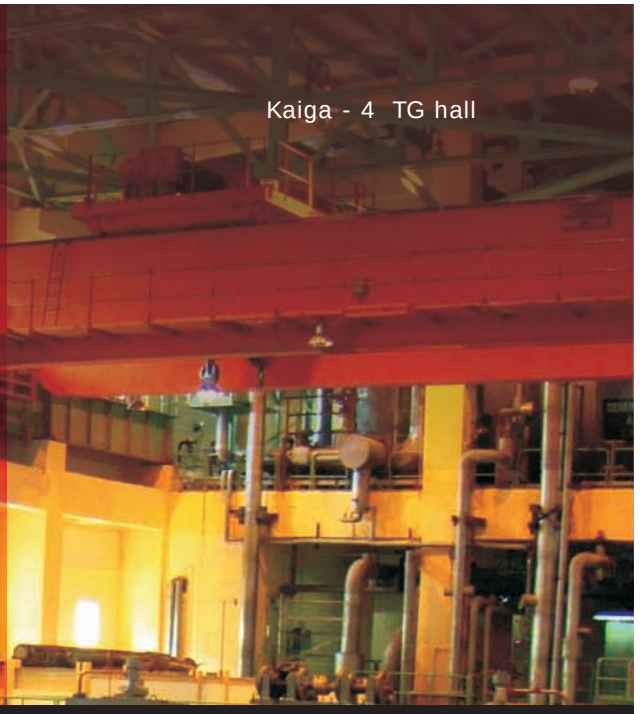
Highlights of the Electrical Systems

- Erection, testing, commissioning energizing of Station Unit Transformers (SUTs) was accomplished in a very short time, adopting innovative erection methodologies to cut down on the time required, which facilitated the powering of equipment in permanent manner
- Installation, testing and commissioning of diesel generators (DGs) were completed by adopting multi-disciplinary integration
- Erection, testing and commissioning of generator transformer (GT), unit transformer (UT) and generator circuit breaker (GCB) of were completed well ahead of time, facilitating early synchronization
- Transmission towers (6 in numbers) of 53-m height were erected during monsoon safely and expeditiously, demonstrating professionalism to the core by strictly adhering to contemporary safety norms
- Erection, testing and commissioning of 220/400-kV switchyard was completed on time



A View Generator Transformer

A View of 6.6 Kv Switch Gears



Kaiga - 4 TG hall

Piping & Mechanical Systems

For the first time, reactor Inlet and Outlet headers (RIHs & ROHs) were fabricated at the site as against shop fabrication, and demonstrated the capability of the team.

Highlights of Piping & Mechanical Systems

- Kaiga-3 feeders were installed in a record time of 96 days. Weld joints were reduced by maximizing on double bends

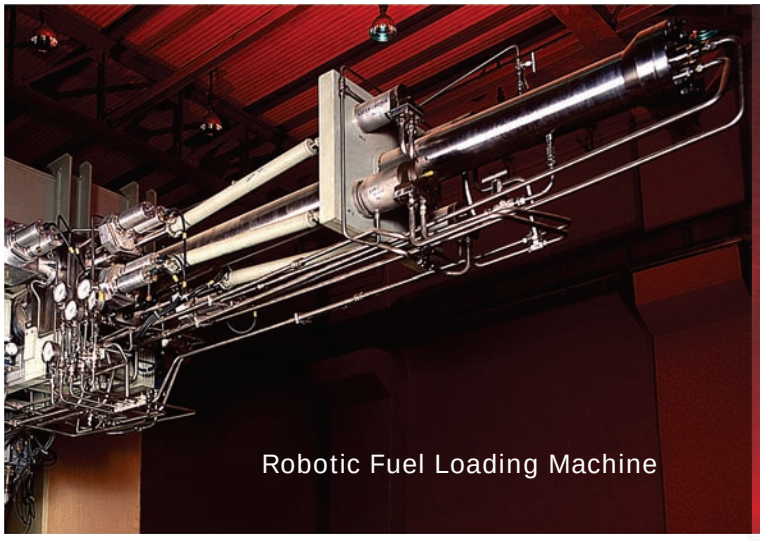
  Hydrostatic test of the primary heat transport (PHT) system was successfully completed in the first attempt, demonstrating the high quality of work done

- Hot conditioning of PHT system was achieved in 55 hrs. and 62 hrs. in Kaiga -3 and Kaiga-4, respectively

- Kaiga-4 steam generators were lowered with a 650-Te crane, aligned and erected in a record time of 3 days for each steam generator, achieving co-planarity within 0.01 mm, flatness of 0.02 mm and verticality within 2 mm, demonstrating superlative performance

Inside View of Calandria Before Welding of Manhole Cover

- Saved time and cost, and increased the integrity of the piping system of vapour recovery duct and common services by reducing welding to the extent of 28000 inch-diameter by employing fittings/specials fabricated directly from pipe spool, leaving one end full length and also by lowering big-bore pipes more than 6-m-long in sizes 200NB, 1100NB, 800NB & 350 NB, etc. in reactor building, moderator room, SSE tunnel, DG basement, annular space before slab/dome concreting using tower cranes with meticulous planning and co-ordination and also with utmost safety
- Scrap generation was restricted and minimized in various piping systems to less than 2% by meticulous planning
- Completed the distillation & evaporation plant in 21 months against a scheduled 43 months and saved 85 days in the erection of distillation columns with the use of the 650-Te crane
- Completed LESS & WMCF plant in 14 months against a scheduled 25 months
- Secondary-cycle piping was completed parallely with primary piping and thus facilitated the heating of the primary circuit through BFP running during PHT hydro test
- CCW & NAPW systems were made available ahead of schedule
- DM plant and Chlorination plants were commissioned in time
- Fire-protection system was erected, tested and commissioned much earlier to facilitate the commissioning of high-energy equipment/systems, which was one of pre-requisites for system/equipment energization

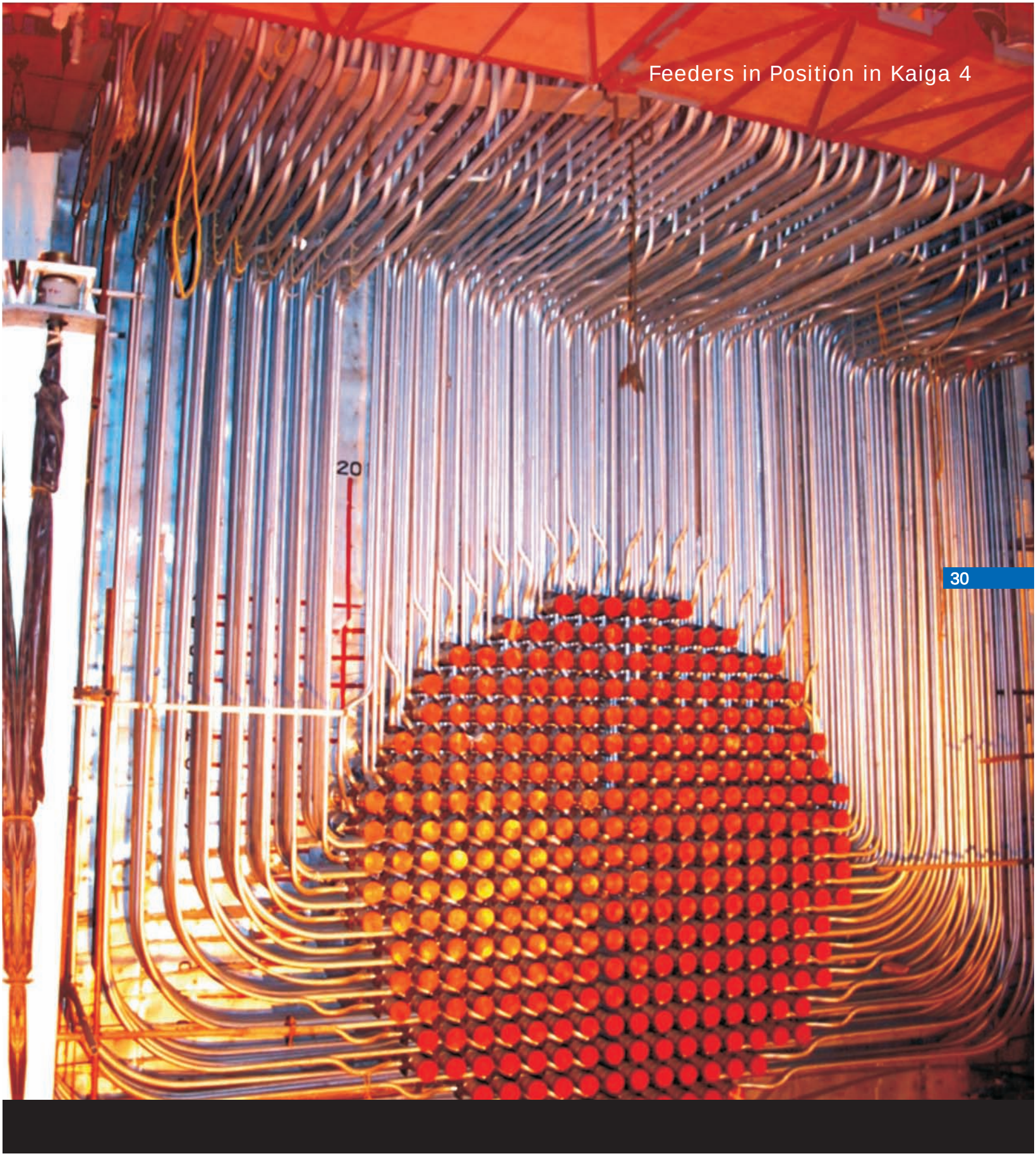


Robotic Fuel Loading Machine

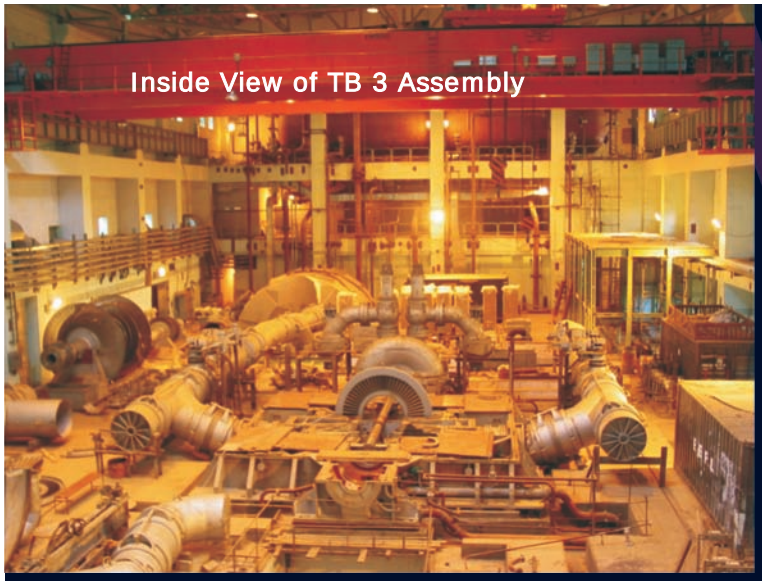
Reactor Components & Fuel Handling System

Highlights

- The alignment and final welding of calandria and end shields was completed in 30 days
- Installation of calandria tubes and EF bellows rolling was completed in 15 days
- Coolant tube installation and rolling with end-fitting body was completed in 24 days with the distinction of no rejection of tubes
- MAL and EAL pneumatic testing was achieved with minimum leak rate in first attempt
- Spent fuel storage bay and inspection bay SS liner plate installation and welding were completed in 57 days
- Erection and alignment of fuelling machine columns and carriage assembly was completed in 30 days
- Reactivity mechanism component installation, welding and drive mechanism installations were completed in 9 months



Feeders in Position in Kaiga 4



Inside View of TB 3 Assembly

Innovative Methods Adopted During Commissioning

Inside view of Cooling Water Pump House

CCW Pump House Kaiga 3-4

Kaiga 3 Moderator Room

Highlights of Commissioning

- Timely Commissioning of GT, UT by back-charging from 400-kV system helped to commission auto-transfer scheme well in advance of generator commissioning

- In KGS-4, in addition to the normal methods of evaluating hot conditioning based on the thickness and quality of magnetite coating, an easy method for the termination of hot conditioning on the basis of dissolved hydrogen in PHT water was established and developed for the first time in NPCIL units

- During PHT drying, the hot water from de-aerator was charged on the secondary side. This did help in ensuring prefect drying of the steam generator within the shortest time. This also avoided the opening of the SG manhole cover for drying confirmation

- Heavy Water addition to Primary Heat Transport system was completed in four days

- After the commissioning of NAPW, a temporary tie was established between NAPW and APWC in the control building. With this, compressors were commissioned in parallel before completing the APWC erection and commissioning

- First fuel loading was completed in 70 hrs

Protecting Environment At Every Step…

"I can't believe this! This cannot be a site for a nuclear power plant! This must be a tourist spot." - Said by a visitor

These flattering words are authentic utterances coming from a visitor to Kaiga power plant site, and yet these words of appreciation cannot do full justice to the mesmerising natural beauty of Kaiga. Indeed, the scenic beauty of the environs of Kaiga defies description. The picturesque location of the NPCIL's Kaiga Generating Station (KGS) is so bountifully showered with nature's blessings that one could be forgiven for mistaking it for an idyllic holiday destination. And it is much more than just visual appeal that makes the Kaiga plant site a truly magnificent spectacle to behold. Beneath the visible layer of lush green forest canopy thrives a veritable cornucopia of flora and fauna. The secret of this natural paradise is the evergreen tropical rainforest. Uttar Kannada district of the southwestern state of Karnataka, bordering the State of Goa, is home to KGS and is located amid the rain forests of the Western Ghats. It rains here for nearly half of the year and the dense forest receives above 4000 mm of rainfall. Moisture-laden rain clouds lunging onto the forest canopy create a dreamy landscape resembling an artist's impression of heaven on earth. The artist here, then, is no human being, but nature itself. Indeed, the forest cover here is so thick and the camouflage so complete that the plant site almost disappears from the eyesight amid the natural span. Naturally, the region supports a wide variety of life, with more than 200 species of birds.

Large mammals like melanistic leopards, tigers and elephants, among other fauna, find a safe habitat here. Apart from supporting a wide mix of fauna, these forests also harbour a diverse range of flora. Bamboo, bauhinia, eucalyptus, lantana, silver oak, teak and Xylia xylocarpa – they are all here. A variety of bonnet macaque, deer (barking, mouse and spotted), Indian Bison, Malabar Civet, Malabar Giant Squirrel, Pangolin and Sloth Bear are among other dwellers of these protected forests. Rare species such as the Black Panther, elephants and tigers are also proud inhabitants of this green haven. The king cobra, krait, python, rat snake and viper are some of the prominent reptiles spotted in the park. As far as avifauna goes, around 200 species of birds are recorded here. These include Ashy Woodswallow, Black-crested Bulbul, Blue-headed Pitta, Brahminy Kite, Broad-billed Roller, Crested Serpent Eagle, Great Hornbill, Golden-backed Woodpecker, Malabar Pied Hornbill, Sri Lanka Frogmouth and Yellow-footed Green Pigeon.

The Exclusion Zone of KGS and the adjoining region host many species including tigers, deer, wild boar, rabbit and peacock. Turtles, jackal, fox, cranes, bear, frogs, large butterflies and leeches are some of the other species found here. Kaiga is indeed a bird paradise and boasts of more than a hundred avian species. Chestnut-headed Bee-eater, White-belied Sea Eagle, White-breasted Kingfisher, Emerald Dove, Common Flame-backed Woodpecker, Purple Sunbird, Brahminy Kite and Gray Hornbill are also found on the backwaters of Kadra River dam. Frog Mouth Nature Club – the nature club at Kaiga, formed as a part of NPCIL's ESP initiative – carries out various activities periodically to spread the message of conservation of nature's biodiversity.

Karnataka also has several other places of interests for eco-tourists – like the Jog Falls, for example, which is the highest-plunge waterfall in India. And if you are already visiting Kaiga, then the world-famous beaches of Goa are not far away from here. Goa is also home to many wildlife sanctuaries and national parks, including the renowned Salim Ali Bird Sanctuary.

Community Relationship & Development Programme

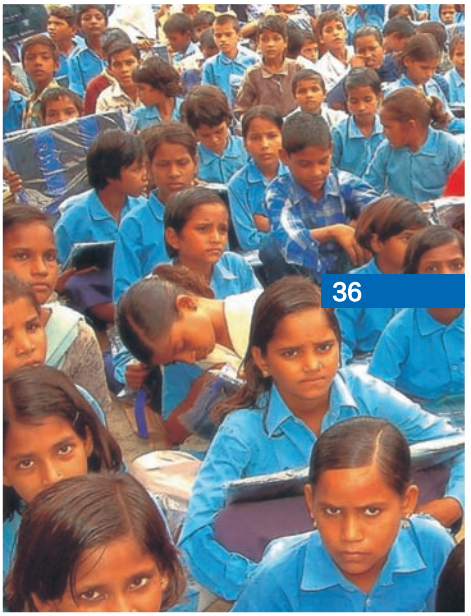
"Locally Global" - That is what NPCIL is.

If scaling newer peaks in technology, performance and safety is one strength of NPCIL, then the other is inclusive growth.

To us, community relationships are central to the larger scheme of things. Inclusive growth is not only a corporate buzzword, but indeed a way of life at NPCIL – and this relationship for us begins from Day 1 – much before the first megawatt of electricity is produced.

Grass-root development is achieved through active participation. NPCIL has a special programme for training and induction of local people into workforce, wherever possible. Locals from the typically rural neighboring areas are trained, and soon they become a part of the workforce, forming significant chunks of teams implementing the construction phase, to begin with. Later on, suitable jobs are preferentially allocated to local candidates who meet the criteria.

For us, local communities are indeed "long-term" partners in progress.



"Impressions..."

VISITORS BOOK

Date	Name & Address	Remarks
2nd April 2008	Anil KAKODKAR Chairman AEC	Important day today as witness the first pour of concrete for Kaiga Unit-3&4. The financial year for the operating units 1&2 has also just ended. I wish to compliment each and every one here on this day and wish them all success in their respective endeavours.

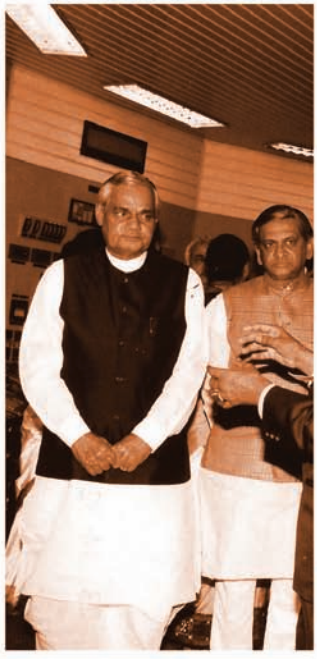
VISITORS BOOK

Date	Name & Address	Remarks
28 Jan 04	Sigval Berg Managing Director - WANO	It is a pleasure to visit the staff and plant. I have greatly enjoyed our interaction and discussion. Your commitment to high performance, nuclear safety will bring consistent solid result. Thank you for a special visit Lydia Berg
		A extremely educating visit. I congratulate Dr Sinha and his dedicated team for the good progress of the Project and make a peace

VISITORS BOOK

Date	Name & Address	Remarks
21 Nov 2008	DALE KLEIN, CHAIRMAN US NRC	Thanks for the great hospitality. Keep up your focus on safety. I look forward to expanding relations between India and the U.S. Best regards. Dale Klein
21/11/08	REBECCA KLEIN, U.S.	Thank you for a very enjoyable day at Kaiga. I hope you can visit us in the U.S. R.A. Klein


"Down the
memory lane..."

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SHRI. A. B. VAJPAYEE


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Kaiga - 3 & 4

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