NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

INDUSTRIAL VISIT REPORT

[Odd Semester 2022-2023]

Kaiga Atomic Power Station

A complete report on industrial visit organized by the Department of Electrical and Electronics Engineering from the New Horizon College of Engineering in order to get practical knowledge about "Generation, Transmission and Distribution of electricity through nuclear power plant".

DATE: 10th November, 2022

Location: Kaiga, Uttara Kannada, Karnataka.

IEEE POWER ELECTRONICS SOCIETY Bangalore Chapter

NEW HORIZON COLLEGE OF ENGINEERING

IEEE NHCE STUDENT BRANCH

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

&

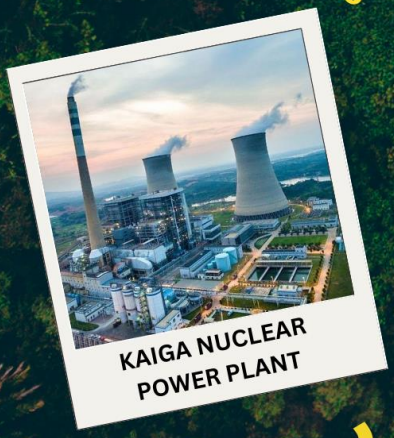
IEEE Power Electronics Society NHCE Student Branch Chapter

Geo-Code is SBC66131

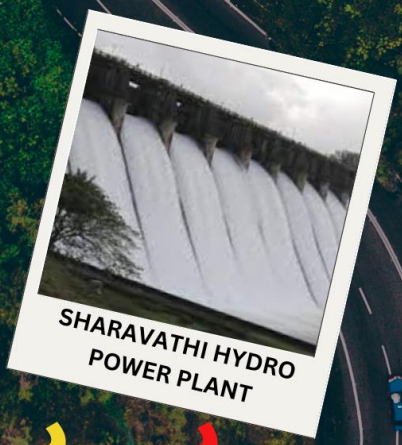
presents

" MEGA INDUSTRIAL VISIT "

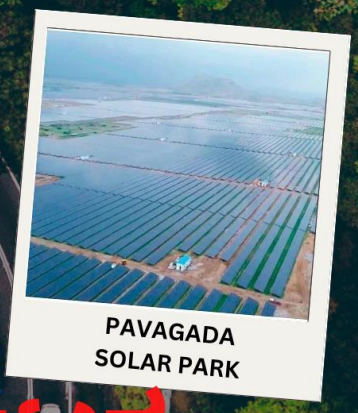
" A key to student development "



KAIGA NUCLEAR POWER PLANT



SHARAVATHI HYDRO POWER PLANT



PAVAGADA SOLAR PARK

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FACULTY COORDINATOR

Mr. Vinod Kumar S

CONVENOR

Dr. Mahesh M

STUDENT COORDINATORS

Mr.Yashvantha P

Mr. Santhosh Melvin D

Date:9/11/22-12/11/22

For Details Contact

YASHVANTHA P
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COME TRAVEL WITH US

DETAILS OF JOURNEY

- The Department of Electrical and Electronics Engineering of the New Horizon College of Engineering had organized an industrial visit on 10th November, 2022 to the Kaiga Atomic Power Station, for the 3rd year and 4th year students of B.E Electrical and Electronics Engineering.

- The visit was organized by the department under the guidance of Dr. Mahesh M (Professor and HOD) and Faculty Coordinator Mr.Vinod Kumar S (Senior Assistant Professor), and were accompanied by Lab Assistant Mr. Rajesh and Mrs. Rajeshwari and the student coordinators Mr. Yashvantha P and Mr. Santhosh Melvin D.

- There was a total of 44 students and 3 faculty were there on the journey.

- The experience was a great and memorable one. It was a really great opportunity to get inside an atomic power station and see the working of the equipment. The staff at the power station were very welcoming and friendly and they explained each and every procedure of the power station in a very clear manner.

- The Kaiga Atomic Power Station is Jointly operated by the Karnataka Power Corporation Limited (KPCL) and the Nuclear Power Corporation of India Limited (NPCIL) and all the procedures within the plant are frequently updated to the headquarters of the Nuclear Power Corporation of India Limited (NPCIL) and the Baba Atomic Research Centre (BARC) located in New Delhi, India.

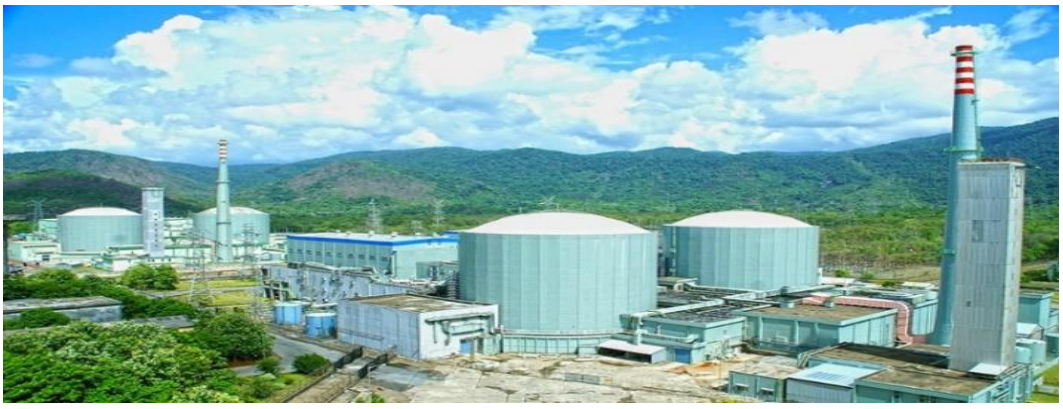
- The staff guiding our team were Mr. Aldrin D'Souza (PRO) and Mr. Sateesh E (Scientist and Control Engineer) at the power station. They explained all the characteristics and the procedures of the Kaiga Atomic Power Station and some of the other power stations across the country.

- We were then taken near the switchyard where we the details of the switchyard components and the auxiliary power units were explained to us. Then, we were taken to the control room simulator which is an exact replica of the control room of the power station except that it is just a simulation setup that is not connected to any part of the plant and it is used for training the candidates.

- Once we finished exploring the control room simulator, we were then taken to the cafeteria of the power station where we were served our lunch. Just as we were concluding the visit, we were also given information on how to pursue a career as an engineer in the power station.

CAREER OBJECTIVE:

In order to pursue a career as an engineer in the atomic power station, the candidate has to clear the GATE examination and earn a suitable rank. Once the candidate clears the GATE exam with a suitable score, they will be selected for the interview process. The interview will be conducted by panelists from the Nuclear Power Corporation of India Limited (NPCIL) and the Baba Atomic Research Centre (BARC) and on clearing the interview, the candidate will be selected as a trainee on the power station and can start training in the control room simulator, on the completion of which they can start as an engineer on board, with a starting salary package of 15 LPA.



POWER STATION DETAILS

- The Kaiga Atomic Power Station has a 220 KV Switchyard and contains both 220 KV and 400 KV Transmission lines that supply power to the central grid.
- The power generated from Kaiga mainly goes to the states of Goa, Tamil Nadu, Pondicherry, Telangana and Andhra Pradesh.
- The power station uses a closed loop circuit.
- The power station uses an Induced Draft Cooling City which helps store water and dispatch it to the bundles in case of a water scarcity.
- The quantity of bundles and the thickness of water is directly proportional to the power that is generated. When there is a large quantity of bundles and the water is very thick then we can generate a higher capacity of power.
- Nuclear Waste is of three types = Solid, Liquid, Gas.
- This is a three-stage program, but we are in the first stage where we produce Plutonium Waste that is used for second stage.
- The reactor is Phospolid reactor. The Uranium 233 gets get converted into Chromium
- In India, there are only 2 centers for research on nuclear prototypes and they are the Indira Gandhi Research Centre and the Baba Atomic Research Centre. They take care of the prototyping procedures.
- There are 2 testing reactors = Kamini and Bamini.
- Kaiga has a record of 962 days of continuous operation and is a world record. This record was broken recently by a Canadian research center.
- There are 1500 workers in Kaiga out of which 150 are female staff.
- In India, we only have Pressurized Heavy Water Reactors (PHWR) in first stage as there is no availability of Light Water Reactors.
- The PHWR uses Uranium 235 but there is Uranium 238 also available. But only 235 is used because there is no fission in Uranium 238.
- Availability of Uranium 235 in nature is more abundant compared to coal.
- 1 gram of Uranium 235 can generate 2 Megawatts of power, which is equal to 2 tons of coal.
- Uranium 235 is good isotope for fission. We have a core for fission which will use heavy water to undertake the chain fission reactor.
- The Kaiga reactor takes heavy water on lease from Indian government for Rs. 25000 for every 1L of heavy water.
- Neutron is a high energy material it travels 2km per second. It is also highly explosive.
- D2O is used to make the neutron slow and prevent explosion. This is called thermalization of neutron. It is calculated on the basis of critical mass and critical distance.
- The distance between each bundle is called a critical distance. We get Barium and Strontium from neutrons and they split up.

- We have rods for mitigation and the main rod is SS Rod
- The gross output of the plant is 800MW and the net output is 230 MW and this translates to an efficiency is 20% to 30%.
- Fission is the splitting of heavy water molecules and Fusion is the joining of heavy water molecules in Kaiga.
- The three types of radiations are Alpha, Beta, Gamma.
- Neutrons give out Alpha radiation and it will also contain the Tritium contamination.

Parameter	**Information**
Power Station Name	Kaiga Atomic Power Station.
Commission Date	1964
Approved capacity in MW	2280 MW
Installed Capacity in MW	880 MW
Type of Project	Major (>25 MW)
Status	880 MW Operational and 1400 MW Under Construction
Owner	NPCIL (Nuclear Power Corporation of India Limited)
OperatingCompany	KPCL (Karnataka Power Corporation Limited) and NPCIL (Nuclear Power Corporation of India Limited)
Address	Kaiga, Uttara Kannada, Karnataka
State	Karnataka

3-Phase Alternator:

Parameter	**Information**
Rated voltage	16.5 kV
Phase connection	Star Connection
Frequency	50 Hertz
Rating	220 MW
Stator current	10000 A

QUESTIONS RAISED BY THE STUDENTS

1. What are the advantages of using Pressurized Heavy Water Reactors (PHWR) over the Light Water Reactors (LWR)?

   Ans: - When a Light Water Reactor (LWR) is being used, we need to cut off the power output from the generating units when it is being refueled thus resulting in a power outage or increased pressure on remaining generating stations thus causing problems to critical facilities. A Pressurized Heavy Water Reactor (PHWR) will support on-run refueling and thus there will be no disruptions in power output during the refueling procedure.

2. What is the difference between the circular shaped reactors that are used in Indian atomic power stations and the square shaped reactors that are used in the atomic power stations of foreign countries?

   Ans: - The circular shaped reactors follow Pascal's Law much more smoothly and have the pressure reacting equally on all parts of the reactor thus making it less vulnerable to explosions. The square reactors on the other hand do not follow Pascal's Law in an accurate manner and thus have higher chances of explosion in certain situations. The use of circular shaped reactors allows for enhanced safety.

3. Why are the raw materials in bundle form?

   Ans: - The bundled form helps in equal distribution of the magnetic fields that are caused due to the Hall Effect.

4. Can we build our own reactors indigenously?

   Ans: - No, there are no reactors that are built indigenously in India as it is not permitted by international forums. Therefore, reactors are always imported.

5. Which are the countries from which we import the reactors?

   Ans: - The reactors in India are mainly imported from countries such as the USA, UK, France and Russia. However, there is some improvisation done to the reactors with technical support from Russia.

6. What happens to the radioactive waste from the reactors?

   Ans: - The waste generated from the reactors is generally restrained within the plant itself and is treated accordingly. The waste product from the plant is an explosive grade of Plutonium that can be used in the manufacture of atomic explosives. Thus, the waste is handled with utmost care.

Sharavathi-Linganamakki Hydro power plant

A complete report on industrial visit organized by **New Horizon College of Engineering** for the students of **Electrical and Electronics Engineering Departmen**t in order to get practical knowledge about "**Generation, transmission and distribution of electricity through hydro power plant".**

DATE: **11th May 2022**

Location: **Sharavathi – Linganamakki, Kargal**

DETAILS OF JOURNEY

New Horizon College of Engineering had organized an industrial visit on 11th November, 2022 to Sharavathi Hydro Power Plant and Linganamakki Dam, for the students of Electrical and Electronics Engineering.

The visit was organized by the EEE department under the guidance of Dr. Mahesh M (Professor and HOD) and Faculty Coordinator Mr.Vinod Kumar S (Senior Assistant Professor), and were accompanied by Lab Assistant Mr. Rajesh and Mrs. Rajeshwari and the student coordinators Mr. Yashvantha P and Mr. Santhosh Melvin D.

There were a total of 44 students and 3 faculty were there on the journey.

Sharavathi Hydro Power Plant in Karnataka was commissioned in 1964. It has an approved and installed capacity of 1035 Megawatt. The type of project is Major and has a capacity greater than 25 MW. The current status of the power plant is Operational. The source of water for the generation of power is Sharavathi River. The basin is west flowing rivers. The power station is located in the Southern Hydroelectric Region. The power plant is owned by the Karnataka Government and the operating company is Karnataka Power Corporation Limited.

The Beneficiary States of the power plant are Karnataka and other south Indian states. The power project was completed in 1977. The total number of turbines used in the power station is 10 and capacity per Turbine is 103.5 MW.

PROJECT DETAILS

Parameter	Info
Hydroelectric Project name	Sharavathi Hydro Power Plant
Commission date	1964
Approved capacity in MW	1035 MW
Installed Capacity in MW	1035 MW
Type of Project	Major (>25 MW)
Status	Operational
Water source	Sharavathi
Basin	West flowing rivers from Tadri to Kanyakumari
Hydroelectric basin	West flowing rivers
Hydroelectric region	Southern hydroelectric region
Owner	Karnataka Government
Operating company	KPCL (Karnataka Power Corporation Limited)
Address	Kargal, Sagara District, Karnataka
State	Karnataka

3-Phase Water-wheel Alternator:

Parameter	Info
Rated voltage	11 kV
Speed	200 RPM
Phase connection	Star connection
Frequency	50 cycles
Power factor	0.9
Rating	30500 kVA
Stator current	1600 A
Rotor current	1000 A
Temperature	45◦ C
Type of CB	595/100 - 30 - T

GROUP OBSERVATION

• This Industrial visit was very helpful in our practical Life & bringing a positive change in our thinking & practical behavior regarding Education & specializing our technical skills.

• Got practical knowledge about the advancement in technology in the renewable energy sector.

• Use of SCADA in management of the entire power house.

• Precision and documentation of the energy due to automation.

• Information on different parts of the turbine and the operation station.

• Different types of machines available for management of generation of hydroelectricpower.

• Management of manpower and machines.

•We have developed the confidence to work in Transmission and Distribution department.

IMPACT ANALYSIS

SL.NO	EVENT NAME	DATE	NO. OF PARTICIPANTS	IMPACT ANALYSIS
1	INDUSTRIAL VISIT -KAIGA ATOMIC POWER STATION AND SHARAVATHI HYDROELECTRIC POWER STATION	10/11/2022 and 11/11/2022	43	PO1,PO2,PO3,PO4,PO5, PO6,PO7,PO8,PO9,PO10,PO11, PO12 PSO1,PSO2,PEO1,PEO2,PEO3

CONCLUSION-Kaiga Nuclear Power Plant

The Students of Electrical and Electronics Engineering department, NHCE are grateful to the HOD and the faculty for providing such an opportunity. This visit has helped us gain knowledge about the generation and the transmission and distribution of power from Nuclear Energy. There was a detailed information on turbines and other equipment. We also learnt the role of SCADA and automation the management of the power system. The visit also built an interest in renewable energy sources for research and building more sustainable projects.

The visit to a fully functional and perennially operational Nuclear Power Plant and a Hydro Power Plant was really insightful to us as it not only clarified the myths regarding renewable energy generation but also showed us a working example of how renewable energy will gain a lot of success in the future if there is consistent and directed investment and effort towards the same

The already existing renewable generation projects and the modifications on the existing projects prove to us that India as a country will be able to satisfy its entire energy demand of 500 GW by using purely renewable energy by the end of 2030 and the remaining installed units will just act as a backup in case of peak demands and maintenance events.

CONCLUSION- Sharavathi Hydro Power Plant

The Students of Electrical and Electronics Engineering department, NHCE are grateful to the HOD and the faculty for providing such an opportunity. This visit has helped us gain knowledge about the generation of hydroelectricity and the transmission and distribution. There was a detailed information on turbines and other equipment. We also learnt the role of SCADA and automation the management of the power system.
The visit also built an interest in renewable energy sources for research and building more sustainable projects.

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