Annual Newsletter

XXII Foundation Day —— STEAG Energy Services (India) Pvt. Ltd.

2023

steag
energy services


BBANK
H2
HYDROGEN
ENERGY
STORAGE
EX

Vision, Mission and Quality Policy

Vision

To be the most admired and responsible energy service company delivering sustainable value to all stakeholders and contributing towards mitigation of environmental impacts of energy production and use.

Mission

To maximize shareholder value while adhering to the local laws and observing the highest ethical standards with the goal of delighting everyone we serve.

Quality Policy

STEAG Energy Services India hereby declares that it is its policy to establish, implement and maintain Quality Management Systems within the organization to ensure that the products and services provided are in accordance with the highest professional standards.

The organization is committed to identify all internal and external issues, the needs and expectations of interested parties that affect the quality of its products and services and adopt a risk-mitigation approach in planning the delivery of its products and services.

The management is committed to continual improvement of the Quality Management System to suitably and effectively meet its objectives of providing products and services to meet the contractual obligations and ensure client satisfaction.

Table of Contents

STEAG HSE Policy

Environment, Occupational Health & Safety Policy

STEAG Energy Services (India) Pvt. Ltd. (STEAG) firmly believes that "Occupational Health & Safety of Human Beings and Protection of Environment" overrides all other business targets. We further believe that all injuries, occupational illnesses as well as safety and environmental incidents are preventable.

We shall strive to be the leader in the field of management of Environment, Occupational Health & Safety.

STEAG is committed to:

- Adhere to all applicable regulations, compliance obligations and requirements that are relevant to our organization.
- Protect the environment including prevention of pollution across the life cycle of all our activities, products and services.
- Create a culture of learning and practicing Environment, Occupational Health & Safety systems and procedures among all our employees, customers and business partners.
- Involve all employees in improving EHS systems, processes and performance by way of suggestions scheme and safety committees.
- Carry out hazard identification and assessment of risks and opportunities for all major and critical activities.
- Eliminate occupational hazards, ill-health and injury at our workplace/customer workplace and reduce OH&S risks.
- Implement environment-friendly measures in our scope of work.
- Use sustainable resources.
- Reduce – Reuse – Recycle and Recover (R-R-R-R) of waste.
- Utilize energy resources in a responsible and efficient manner so as to reduce emissions and generation of effluents and waste products.
- Conduct all our activities in such a manner as to avoid harm to all our employees, customers, visitors, business partners and community.
- Provide and maintain safe, healthy and environment-friendly workplaces for all our employees and other stakeholders in all operating processes.
- Endeavour to work with customers to align with their H&S standards by giving utmost importance to our customers.
- Ensure that the health and safety aspects are integrated in the customer governance structure and adhere to the customer's health and safety policies.

In-line with this policy, STEAG shall establish Environment, Occupational Health and Safety objectives for each process, which are appropriate and support the purpose, context, and strategic direction of the organization.

STEAG strives to achieve these objectives by:

- Communicating and practicing this policy extensively throughout our operations within the organization.
- Disseminating learning from investigations of incidents, internal and external, to all our employees, customers and business partners, and taking steps to prevent such occurrences in its work.
- Using this policy for regularly setting, measuring and revising our Environment, Occupational Health and Safety objectives at the appropriate levels, functions and processes.
- Designing plants with proper and adequate safeguards for ensuring process safety. Carrying out process and operational changes through well-defined systems and strict adherence to the same.
- Recognizing importance of promoting and implementing this policy effectively throughout our entire supply chain, from our suppliers to our customers, to ensure proper and efficient use of our services in accordance with agreed upon specifications.
- Making this policy available to all relevant stakeholders. Reviewing regularly and updating the systems and procedures to ensure that it remains relevant to the context of our diverse business operations.
- Identifying and evaluating health risks related to operations and carrying out pre-employment and periodic medical checkup of its employees.
- Keeping abreast of the latest international codes, standards and practices and adopting the same, wherever applicable.

From the Chairman's Desk

A return to Growth

While last year at this time we were still in the grip of the virus, it now appears that we in India have definitely a welcome respite. Nevertheless, it is advisable to remain alert especially since many are affected by an easily transmissible flu. However, it is clear that near normal life has resumed and we have seen an uptick in the business which requires all of us to travel more frequently.

As we complete 22 years as a company in India, we see once again fresh challenges and opportunities. The past year has also seen the restructuring of the STEAG Group to make it ready to accelerate the pace of its transition to Renewable Energy. The restructuring also resulted in expansion of STEAG India with inclusion of STEAG Energy Services Botswana as a wholly owned subsidiary of STEAG Energy Services India with effect from January 1, 2023. We are also planning to establish an office in Dubai to accelerate marketing efforts in the Middle East.

There is a clear recognition that in many parts of the world including India, coal and other thermal based generation will continue to be significant, even though countries like India have put in place strategies for accelerating the process of transiting to Renewables at a much faster pace than at present. The international seminar we hold this year is on "Hydrogen – the fuel of the future is here" is, therefore, significant since the Government of India is taking up the subject in a mission mode and it requires a deep dive into all the related issues. We expect that, as usual, we would have triggered of a healthy debate and discussion which, in turn, will open our eyes to the upcoming opportunities in the hydrogen space.

While we evaluate the potential for work in the renewable space, we have seen significantly higher number of projects to revive stranded coal-fired units and to make the older units more reliable and efficient. The demand for power is expected to continue to rise and it will not be before 2030 that we will see renewables take a major share of the production. Till then, there will be a growing demand for services centered around reviving and renovating existing plants in the developing world. We are currently working on several projects in India and abroad where old plants are being renovated. Our most significant achievement last year in this field was the successful R&M of Unit #1 of the 4x600MW at Jharsuguda. This was indeed a challenge because of the unprecedented scope of the project. All economizer tubes and almost all reheater tubes were changed in toto leading to the removal and replacement of over 1000 tons of metal. There were severe constraints for material movement since the other three units were in service and innovative methods had to be devised to carry out the work. Concurrently, the turbine was given a capital overhaul and other major sub-systems were renovated. The end result was not only restoration of design heat rate, but we could also operate the unit higher than its rated capacity along with significant gain in reliability. In all, over 2,500 people were working at the site and it was particularly satisfying that the work was carried out with only a few minor safety violations. The next one, Unit #4 was shut down on January 20, 2023 and will undergo a similar renovation over a 60-day period. Taking up such projects required close working between the Engineering and O&M divisions and Technical Services. This triad will become increasingly active in different phases such as the gap analysis, preparation of technical and commercial specifications and the execution of renovation projects. The Commercial division has been strengthened to cope with the commercial conditions of EPC type projects, which have a different legal framework compared to O&M contracts. The recent R&M contract with GE was a real-life learning experience not only for the Commercial division but for the whole organization.

The work of digitalization has received a boost with many generating companies wanting to take up projects for centralized monitoring of operations of the generating fleet. We are hopeful of taking up such assignments in this year apart from our normal activities in the field pertaining to supply of simulators and continued servicing of online optimization systems. We have entered into a public private partnership with GIZ to develop a simulator to train operators on flexible operations of 500 MW coal plants.

On the Transmission & Distribution side, we have now started increasing our portfolio in India and also received significant orders in Bangladesh this year with clients like Powercell, etc. We expect to acquire more business in this new area.

On the O&M front, the most significant new order was for the O&M of the captive plant of the Haldia Petrochemicals. We feel proud that HPL management has called us back to this assignment after trying out other parties, who were not able to maintain the same standards of operational excellence that we had achieved during our earlier period there. We continue to receive enquiries for O&M and it is planned that we can take up one more large O&M assignment this year.

The significant change in our approach in executing large O&M contracts is to insource several key positions of technicians especially those requiring special skills. We have done this at Jharsuguda where we had earlier a contract with a subcontractor, to whom we outsourced the major maintenance activities except coal handling. This contract was mutually terminated on December 18, 2022, and we have insourced all the subcontractor staff directly or onboarded them through an onboarding contractor. We expect a quantum jump in the quality of work and also, we hope to reduce overall costs both of which are essential in this era of increased competitiveness.
The COVID restrictions also resulted in developing online training facilities for training and there was enthusiastic response to online simulator training as well as other modules. The Training Division has received extension of its recognition by CEA for another 3 years and will continue to do online training along with offline. Breakthroughs have also been achieved in providing training to international clients with trainees from several countries being provided training at the Noida Center.

Organizationally, the concept of Profit Centers being responsible for their growth and EBIT results has been further consolidated with each Center having its own marketing and sales and we expect that they will further mature in the year ahead. All divisions are gearing up for the increased activity foreseen in the coming months, especially the significant increase in international assignments especially in Vietnam, Turkey and the Middle East apart from Bangladesh and Southern Africa. Though the world has entered into an era of economic turbulence and possible recession, our field of work does not appear to have suffered where we see increasing demand for our services.

As with most organizations, the lifting of COVID restrictions has resulted in increase in pent up attrition as the constraints to changing jobs have been lifted. This placed an enormous burden on the HR division who have handled this efficiently. They have also commissioned a new HR software suitable for online working and its modules are being progressively put to use. We have also renewed our medical and other insurances with added features post COVID to take care of the new health challenges-this includes online medical consultation free of cost and enhanced benefits.

I would like to conclude by thanking our shareholders for their constant support especially in the COVID period. The joint projects in third countries are headed for exponential increase and we are gearing up for this.

I wish the STEAG families in India and abroad good health and prosperity in this year and, now that the dark clouds of COVID are behind us, we are happy that we can gather once again physically to celebrate the 22nd anniversary of the STEAG Energy Services India and rejuvenate and commit ourselves for the challenges ahead.

With best wishes

Dr. Jacob T. Verghese
Executive Chairman

Highlights from the Corporate Office

New areas of work

O&M orders for solar PV plants

SESI embarked upon its solar O&M journey in India by securing O&M contracts for three solar PV plants starting January 2022. Each of the three plants have 10 MW capacity and all are located in Telangana state close to each other. The contracts are for a period of three years and include site security beyond the routine O&M activities.

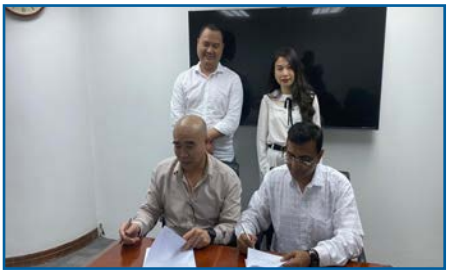
We have successfully completed one year of these contracts in December 2022. During the year, our team has performed many site improvement activities beyond the routine O&M. As a part of the generation improvement program, our team has replaced the old Fimer inverters with new ones from Hitachi, for which we got special appreciation from the client. Also, the regular string repairs and tracker maintenance has ensured up to the mark generation.

Keeping up with our reputation of safe operations, all the three sites had 100% safe man-hours with nil incidents. One of the major thrust areas has been constant training and safety interactions with the business partners manpower deployed at the three sites. The three sites put together had 155 training programs, 691 toolbox talks and 17 mock drills during the year 2022. We have no LTI's at the three sites for the year 2022. We are also following COVID-19 protocols and ensuring zero cases at the sites. We have also developed organic farming with the help of our employees are providing organic vegetables to our employees.

International orders received

Vietnam

A contract was signed between PETROCON and STEAG Energy Services India for technical advisory services on April 14, 2022 in Hanoi for commissioning Unit #1 of 600 MW Thai Binh 2 project. PETROCON is the EPC contractor of this project and the sister concern of PVN, who is owner of this plant.



Contract signing with PETROCON

Order received from The Institute of Energy, Hanoi, Vietnam for providing consultancy services as "Verification consultant of feasibility study report of the Quang Ninth LNG power project" on October 17, 2022.

Order received on December 29, 2022 from Vietnam Oil and Gas Group for visual boiler inspection, broad design engineering assessment and submission of report for 2x600 MW Long Phu 1 project.

Bangladesh

Contract for energy auditing and efficiency improvement procedures for power plants and assessment of cogeneration potential in the industrial sector in Bangladesh.

Mr. Rakesh Mishra signing the contract of SESI behalf

The contract was signed at the Power Division office in Dhaka, Bangladesh on April 6, 2022. Md. Nurul Alam, Additional Secretary, Planning, Ministry of Power, Energy & Mineral Resources from the Power Division and Mr. Rakesh Mishra, ED from SESI signed the contract.

Contract from EPV Thakurgaon Limited for providing project management services for the implementation of 115 MW HFO power facility in the Thakurgaon District in Bangladesh.

Contract from Power Cell, Bangladesh for conducting a feasibility study for the multipurpose use of land for renewable energy projects in Bangladesh.

Contract from S. S. Power I Ltd., Bangladesh for providing consultancy services for assessment of organizational structure and remuneration structure for operation and maintenance of the 2x612 MW coal-fired power plant at Chittagong, Bangladesh.

Middle East

Order received from Rabigh Arabian Water and Electricity Co. (RAWEC) on May 19, 2022 for fuel conversion feasibility study – Part II for RAWEC (in association with SESG). An amendment to this order with additional scope was received from RAWEC on January 7, 2023.

The AMC of the existing supplied high-fidelity ISWPP integrated plant process operator training simulator was given by RAWEC, Saudi Arabia on February 24, 2022.

Turkey

Order for conducting Remaining Life Assessment (RLA) studies of the boiler of one Unit at SOMA TERMIK SANTRAL ELECTRIK URETIM A.S., Soma/Manisa by ANADOLU BIRLIK HOLDING A.S., Turkey.

Other international orders

SESG Germany awarded the order to SESI for providing training support to VIRA experts in Germany for 5 days. The training was conducted by an SESI expert in Germany.

Contract from EGENCO, Malawi for training of their personnel on the development of 300 MW coal-based power project.

New initiatives

Launch of Zing HR software

A new HR Software "ZING HR" has been launched in the month of July 2022 for bringing in better employee connect, user interface experience with our overall aim to move to digitalization and paperless works. It is a full-fledged mobile compatible HRMS tool and the employees can access all HR information through this software.

Zing HR app

In the first phase, we have started with the Leave & Attendance Module in the month of July 2022. Gradually PMS, Employee Life Cycle, Learning Management Systems and other modules will be introduced in phased manner in coming months. The website can be accessed by logging on to www.steagindia.zinghr.com and the mobile application "Zing HR App" can be downloaded from Google Play store.

Launch of MediBuddy app

This year, SESI has taken yet another initiative to provide our employees with free of cost online doctor consultation facility for self and family (including parents) via the MEDIBUDDY app. SESI decided to introduce it for all the employees for a period of one year starting from July 18, 2022. The premium is completely borne by SESI. The app also has features like online medicine ordering at a discounted rate, online order for sample collection from home etc.

Launch of the MediBuddy app

Simulator for flexibilization – Agreement with GIZ

The agreement between STEAG Energy Services India and GIZ under DPP (Development Partnerships with the Private sector) for a joint project to enable the operators of power plants in India to adapt to fluctuating power generation from renewable energies.

India plans to increase renewable energy generation to 175 Gigawatt until 2022. Most of the renewable power will come from fluctuating source such as wind and sun. When this fluctuating power from renewable energy sources is fed into the electricity grid, less conventional power generation is required. Most of the conventional power generation comes from existing coal-fired power plants, which have to ramp down within minutes to make room in the electricity grid, when power from fluctuating renewable sources is generated. When less renewable power is fed into the electricity grid, the coal-fired power plants have to increase their generation again within minutes to guarantee the power supply for the country.

New skills are required to enable the operators of coal-fired power plants to adapt to fluctuating power generation from renewables. Therefore, a simulator, which is able to simulate the realistic, but to great extent, still unknown behavior of commonly used 500 MW coal-fired power plant shall be developed for the operators under flexible conditions.

The 500 MW Simulator will get ready by the middle of February 2023 with further changes to adapt to the flexible operation.

A fully functional simulator for flexible operation of thermal power plants will be used for training of 200 operators. Operators of around 50 different public and private energy generation companies, who are in charge of an estimated amount of 80 coal-fired power plants are expected to participate.

Major achievements

Unit 3 at Jharsaguda put back in service

Unit 3, which had been out of service since mid-December 2021, had major repair work done and was put back into service on February 28, 2022 after changing the Omega joint and carrying out major hauls of the turbine and boiler.

MoU signed with MAHAGENCO

On World Earth Day, Maharashtra State Power Generation Co. Ltd. (MAHAGENCO) organized a Technical Workshop titled "Maharashtra Energy Global Partnership". On this occasion, an MoU was signed between MAHAGENCO and STEAG INDIA in the presence of the State Minister for Energy, Dr Nitin Raut on developing the strategy for adoption of flexible operations of power plants. Flexible operations of power plants will impact the life of the boiler components and efficiency and new tariff regimes would be required to be established. The MoU will "help prepare MAHAGENCO for the challenges in the future." said Mr. Sanjay Khandare, Chairman & Managing Director, MAHAGENCO. MOU was signed as a follow up of Dubai Expo 2020 event in December 2021, in which both STEAG Germany and India participated.

Unique safety record achieved at HMEL Bathinda site

The STEAG team at the HMEL refinery at Bathinda has set a remarkable record by achieving zero lost-time accident (LTA), which is only the second time it has done so. The refinery site has also achieved a record continuous period of more than 8 months without a medical treatment case (MTC), which is the best so far. STEAG achieved 7.92 LTI-free million man-hours and 3078 LTI-free man-days till April 2022. To put the MTC achievement into perspective, over the last three years the refinery itself has averaged an MTC every 6 weeks.

This achievement is down to the hard work on safety by both our employees and our contractors.

The focus will continue on a robust near-miss reporting and STAR to identify and remove potential accident risks and remain an accident-free work place.

Successful launch of paid online training programs conducted by STEAG Learning Center

After ascertaining the interest levels for paid online training programs, the first program was held on November 18, 2021 on the topic **"Boiler Tube Failure Mechanisms and their Corrective & Preventive Actions"**. This training program was over-subscribed and a total of 51 persons attended this program. All the participants appreciated the program very much. Thereafter, 6 more such programs were organized in the months of December 2021 and February, March, April and May 2022. Based on this, a number of similar programs are planned in the coming months – 4 in the month of June 2022. A total of 40 online paid programs are planned in the current financial year 2022-23.

Breakthrough in FGD consultancy services

Gujarat State Electricity Corporation Ltd., Vadodara:

- Order amendment 1: Providing detailed engineering services as Owner's Engineer for installation of Flue Gas Desulphurization System (FGD) at 800 MW Wanakbori Unit #8 till closing of contract.

- Consultancy for design, engineering, supply and procurement, construction, erection, commissioning and testing to achieve stack emission for NOx less than 100 mg/Nm3 at 1x800 MW Wanakbori thermal power station extension, Unit #8.

APGENCO:

- Engineering consultancy services for installation of wet limestone based Flue Gas Desulphurization (FGD) systems for RTPP Stage IV (1x600 MW) Unit #6, V.V. Reddy Nagar, YSR Dist., Andhra Pradesh.

- Dr. NTTP Stage-IV (1x500 MW) Unit #7, Ibrahimpatnam, Vijayawada, NTR Dist., Andhra Pradesh.

IEA Annual Conference

Dr. Arun Kumar V (Project Manager, R&D and Renewable Energy) at SESI, and an expert on the task force of the project on "Maximizing the Green Energy (solar) component in community and buildings gave a presentation on the topic "Design and Optimization of Combined Cooling, Heating and Power (CCHP) with Storage" in the annual conference held at Kassel, Germany held from September 28 to 30, 2022. The main contribution of his work is towards optimization of CCHP with case studies for smart grid, micro-grid and solar buildings. The conference was followed by the annual project meeting. Other IEA experts from Stuttgart University, Denmark Technical University, Austrian Universities, China Academy of Building Research, industrial representatives of PVT were present in the meeting.

The International IEA Expert Team

Renewal of recognition of STEAG Power Plant Learning Center

The Ministry of Power (T&R section) granted the renewal of recognition to STEAG Power Plant Learning Center of STEAG India. A team of CEA officers audited the center to assess the requisite facilities for meeting requirements of recognition as per provisions of CEA Regulations 2010. The center is recognized as Category-I institute and the renewal has been granted for imparting training in operation & maintenance of thermal power plants for next 4 years with effect from September 1, 2022.

R&M of Unit #1 at Jharsuguda

Renovation of the boiler and capital overhaul of the turbine and other systems commenced at Jharsaguda in July 2022. Extensive renovation work is under execution including complete replacement of the economizer and reheater tube banks, apart from retrofitting new high efficiency burners etc. All 4 boilers will be dealt with in a similar manner.

Erection and commissioning activities completed, boiler lit up done on October 5 and synchronized on October 7, 2022. The unit achieved full load on October 11, 2022 and reached a maximum generation of 608 MW. Presently, punch points are being closed. PG test will be performed after isokinetic test and operational readiness.

Seminar on Flexibilization

STEAG was invited to participate in a workshop in Kolkata on November 22, 2022 on "**Flexible Thermal Power Plants, Bridge to a Decarbonized Energy System**" in The Grand Oberoi hotel, Kolkata. The workshop was organized by EEC, IGEF and VGB and inaugurated by the Chairperson of CEA. Mr. Debasish Patra, Executive Director of STEAG India, attended the workshop as EEC's elected member.

Dr. Daniel Lehmann from STEAG Germany made a presentation (virtually) on "**Usage of Battery Storage for Flexibilization of Power Plants**". Various utilities in the Eastern region namely, DVC, WBPDCL, Hindustan Power, CESC etc. also participated in the workshop.

O&M contract of Haldia Petrochemicals Ltd.

STEAG was awarded the O&M contract for the operation and maintenance of the captive plant at Haldia Petrochemicals Ltd. The LOI was placed on November 23, 2022 and the contract was signed on December 29, 2022 on behalf of SESI and Mr. Animesh Chattopadhyay (Chief General Manager – Materials) on behalf of HPL. The takeover took place on December 31, 2022 at 2400 hours. The captive plant has combined cycle gas turbines and CFBC boilers. It may be recalled that SESI was the O&M contractor in the period from July 2006 to July 2015 and has been recalled once again.

Other highlights

Twenty-First Foundation Day

Under the shadow of the Corona pandemic, SESI celebrated its 21st Foundation Day on January 28, 2022, once again, in the virtual mode. The theme for the foundation day "Enhancing our Digital Footprint and Transitioning to Renewables" highlighted the entry of SESI in the renewable energy market and pointed towards its planning for the next 20 years. Ms. Anusuya Jana welcoming the dignitaries from Germany and all employees and their families on behalf of the organizing committee.

This was followed by the addresses of Dr. Ralf Schiele, Mr. Ulrich Siegel, Dr. Jens Reich and Dr. Verghese, who appreciated their contribution towards the success journey of SESI. The lamp lighting ceremony, to mark the start of the event, was also done virtually.

Foundation Day Celebrations

The performances of our employees were also broadcast on the virtual platform. The highlight of the performance was the tribute to Corona warriors performed by our employees at the Kashipur site. Other performances were rendered by the family members and our employees from Noida, Kashipur, Hazira and Jharsuguda sites.

Tribute to Corona warriors – Kashipur

The event concluded with the display of the names of the employees, who had completed 5, 10, 15 and 20 years of service with SESI and the vote of thanks by the Chairman of SESI. The virtual event was well appreciated and the EMCEEs and organizers were thanked for their efforts in putting together the event, in spite of the offices being closed.

Felicitation of long service awardees

Our Executive Chairman, Dr. J. T. Verghese personally handed over awards to Noida office employees who had completed 10, 15 & 20 years' service with the company on February 17, 2022. He also addressed all our employees at the Noida Office and shared his thoughts.

Felicitation of long service awardees

Keeping in mind the COVID-19 protocol, the function was held within the premises of the office in the open area between the A-29 and A-30 buildings.

Business News

In sync with the parent company's strategy, we are steering the company towards renewables and it heartening to report that we have, in the past year, taken over the O&M of solar installations totaling 30 MWs in Telangana. Likewise, we have, in the last year, been awarded contracts for OE services for a Waste to Energy plant at Ghazipur followed by a turbine overhauling contract. We have also achieved a breakthrough in FGD technology by bagging orders from Gujarat State Electricity Corporation and APGENCO. We hope to foray into the industrial sector following our success in bagging the O&M contract for the refinery substations at the Petrochemical complex of Arcelor Mittal at Bhatinda. We have also taken up the EPC for a 65 KW rooftop solar plant for the Vatican Embassy and an 18 KW plant for a farm house. Likewise, we have taken the first step into branching out into E-Mobility with the award of the first project for a study in Uttar Pradesh.

Hazira

During the year 2022 starting from April to December-2022, training conducted on various technical topics by In-House trainer from each department. Total 58 no's of training on technical topics conducted.

ISO 9001:2015 1st surveillance audit conducted on March 9, 2022.

A felicitation program was organized for all the awardees of 2022 from the Hazira site for their long service with SESI on February 14, 2022 at the Hazira O&M site.

Felicitation program

A Level -2, Mock-Drill was organized by our Mutual-aid Partner (Gujarat Gas Company Ltd) for Emergency Services.

The Safety Training on "Use of Chlorine leakage arrestor kit and BA set" was carried out by EHS department on 25th November 2022.

A Presentation on General Safety Awareness and Safety Training on "First aid firefighting" by EHS Dept. carried out on September 29, 2022.

First aid firefighting

Every year, the World Environment Day is celebrated on June 5 across the world. At the Hazira site, it was celebrated on June 6, 2022 by planting TREES at designated Green Belt area. Around 100 tree saplings were planted.

Plantation of tree saplings

Attended two days seminar "Occupational Health – Challenges and Strategies" at Indian Association of Occupational Health at Vadodara Branch.

With a view of achieving a "Zero Accident" target at the Hazira O&M site, STEAG Hazira site management introduced the "Employee EHS Rewards & Recognition Scheme".

To celebrate the "Azadi Ka Amrit Mahotsav", (a celebration of the 75th Independence Day of India this year) STEAG, Hazira site along with GSEG planned various activities from May 2022 to September 2022.

Drawing competition was organized on May 24, 2022 for the children of our employees. A total of 17 kids took active part in the drawing competition.

Drawing competition for kids

The International Yoga Day was celebrated on June 21, 2022.

"Tree Plantation Drive" was initiated at designated green belt area inside GSEG Power plant, Hazira site on July 28, 2022.

Tree plantation drive

"Swachhata Abhiyan" was conducted on August 29, 2022 at the 351.43 MW CCPP STG floor and mechanical workshop and surrounding areas. All STEAG employees participated actively.

Five days grand celebrations from August 31, 2022 to September 5, 2022 were observed at the Hazira site to seek the blessings of "LORD GANESHA". All departments got an opportunity to carry out pooja on these days and everyone took active part in rejoicing the festivity with sheer devotion and joy. Shri Vishwakarma Puja 2022 was held on September 17, 2022 at the GSEG, Hazira plant to pay a humble tribute to Lord Vishwakarma – the architect of gods and the god of all skills.

Lord Ganesha Puja

Bathinda

"500 Day of Continuous Operation", a milestone achieved by the utility boiler 6 (CFBC-2) operated on PETCOKE, one of the best performances among all solo PETCOKE CFBC boilers in India.

CPP achieved the highest steam generation of 1420 TPH on November 18, 2022 for the first time since inception of the plant.

"Maximum Participation Contractor" award for the year 2022 was won by the STEAG team among all refinery contractors in "Fire & Safety Campaign 2022". The trophy was awarded by M/s. HMEL COO Mr. A. S. Basu, VP Operations Mr. Krishna Tuteja and VP Petrochemical Project, Mr. M. B. Goel.

Maximum participation contractor award – Fire & Safety Campaign

"Maximum Participation Contractor" award for the year 2022 was won by the STEAG team during Process Safety Management (PSM) Week Celebrations recalling the "Bhopal Gas Leak Incident" in the first week of December, 2022. The trophy was awarded by M/s. HMEL COO Mr. A. S. Basu, COO and VP Technical Mr. Chugh.

Lord Ganesha Puja

"7.97 million LTI-free man-hours" and "3323 LTI free man-days" was achieved by STEAG till December 31, 2022.

"Learning from Incident" book was launched by STEAG on April 1, 2022 describing over 125 past incidents of CPP, refinery units and PETCHEM. The book is kept at all the strategic locations of CPP reachable to all employees to increase the awareness among the employees.

Book launch "Learning from Incident"

"External First-Aid" training organized in the CPP from April 20 to April 24, 2022, Total 120 STEAG employees actively participated. Every 1 out of 4 is a First Aid Trainer.

External first-aid training

"Safety Star of the Month" for the year 2022 awarded for 40 employees of the STEAG

"IIF (Incident & Injury Free) STAR certification" a new initiative started by STEAG for second level supervisors.

STEAG achieved 100% IIF-SSK certification for SSK supervisors as per HMEL EHS procedure and rules.
STEAG audited highest number of internal work permits around the refinery in FY-2022, analysis done and shared with all the employees along with recommendations for improvements.

CPP IMS (Integrated management System) audit successfully carried out on February 03, 2022. No non-conformity reported. Auditors appreciated the knowledge among the employees and documentation maintained by CPP team.

ISO 9001:2015 and ISO 14001:2015 surveillance audit - FY 21-22 successfully carried out on May 9, 2022. Auditors appreciated many practices and also suggested improvement points in some areas.

ISO 45001:2018 external surveillance audit for FY 2021-22 successfully carried out in June 2022. The auditors appreciated many practices and there was no non-compliance.

OISD (Oil Industry Safety Directorate) external audit carried out successfully in CPP on December 15, 2022.

Mr. A. K. Ghosh (STEAG turbine consultant) visited the site from March 13 to 17, 2022 for gas turbines 1 and 2 and steam turbine 1 vibration problems study. Mr. Ghosh gathered the information, studied and presented his report with recommendations to the CPP and HMEL Management.

Two days OEM (ISGEC) online training program conducted by STEAG for CPP employees (both STEAG and HMEL) on topics "CFBC Operation and Optimization Aspects" and "CFBC Maintenance & Inspection aspects" in the month of January 2022.

Kashipur

STEAG at Kashipur site is committed to ensure that the health and safety of all its employees/ stakeholders and preservation of environment is of paramount importance and takes precedence in all its decisions. The health and safety of its employees, who may be impacted by its operations, is its prime concern and in pursuit of this belief and commitment STEAG has made significant progress towards zero harm by engaging all level of employees and contract partners.

Implemented safety performance standards. housekeeping drive, 12 leadership safety walkthrough (observations raised 148 and closed 142), safety training: 2568 man hours on 60 topics, 2535 safety toolbox meetings (i.e., 2076 manhours), safety awareness programs, 34 induction program, 12 EHS meetings (issues raised 16 and closed 13), near-miss reporting (NM raised 283 and resolved 271). Celebrating various important safety related programs etc.

Plant being operated and maintained successfully without having any incident or accident during the year 2022. Total LTA free manhours worked at Kashipur site during this year are 1,12,816 and since inception (commencement of PO) are 8,89,326.

Plant was completely under shutdown during the year 2022 due to no generation schedule from UPCL-LDC because of high imported LNG cost. However, plant availability maintained at 100%. Plant's equipment kept under preservation. Equipment availability maintained through schedule trial runs. Condition-based maintenance schedule being followed.

The 73rd Republic Day was celebrated at Gama plant with a tricolor hosted by Mr. B K Anand/GM from Gama and followed by a speech by Mr. Rajiv Dhenge/GGM (O&M-CCPP). Sweets distributed with light refreshment. This year's Republic Day theme was **"Azadi ka Amrit Mahotsav"**.

Republic day celebrations

51st National Safety Week celebrated from March 4 to 11, 2022 with a national safety theme – **"Nurture young minds – Develop safety culture"** at the Kashipur site. Various competitions, such as essay writing (Hind/English), safety slogans (English/Hindi), safety quiz and drawing were organized to spread the importance of safety among employees and their families. Closing ceremony was conducted on March 4, 2022 with a distribution of prizes to the winners of different competitions held during the week.

Safety week celebrations

79th National Fire Services Day was observed on April 14, 2022 to highlight the importance of fire services and to pay homage to the firefighters, who sacrificed their lives in the line of duty as they fought the huge fire that had erupted following the explosion on a ship S. S. Fort Sticken berthed at the docks of Mumbai Port Trust. EHS organized the awareness training on firefighting systems available in plant. Explained how to use various types of portable extinguisher during fire. Mr. Rajiv Dhenge explained the gathering, why National Fire service day is observed, what is the history behind it and what is its importance, etc.

National Fire Services Day

50th World Environment day was celebrated on June 6, 2022 at the Gama Power Plant with the UN Environment theme "Only One Earth" for the year 2022-23 to mark the importance of nature and the environment. Mr. Rajiv Dhenge created the awareness about the significance of the environment day and expressed how we are a part of nature and how intimately and unequivocally we depend on it for survival. It provides food, shelter, air, and fulfills all human needs. Likewise, it maintains ecological balance on earth. At the end, saplings were planted to mark the occasion and sweets with light refreshment were organized.

World Environment Day celebrations

The 76th Independence Day was celebrated at Gama plant on August 15, 2022 with the theme **"Nation First, Always First"**. The national flag was hoisted followed by a speech by Mr. Rajiv Dhenge/GGM (O&M-CCPP). Remembered and paid homage to all the great leaders and freedom fighters, who scarified their life in order to set India free from the British rule.

Structured annual training program for the development of O&M team is planned at the beginning of each year. Depending on the plant specific requirements, different technical training sessions are planned and conducted by internal experienced engineers once in a month for each individual. A full day training for O&M team members in two groups, on specific topics conducted without disturbing the plant O&M activities. During 2022:

- Technical sessions conducted for engineers: 60 topics (1318 manhours)
- Technical sessions conducted for technicians: 63 topics (563 manhours)

Plant O&M review meeting held on August 8, 2022 at the Gama Infraprop Pvt. Ltd head office, Delhi. Dr. J. T. Verghese, Executive Chairman, along with Mr. M. K. Gupta, Senior ED (O&M Business), Mr. Rahul Goyal (MD, GIPL), Mr. Y. P. Arora (VP, GIPL) participated in the meeting. The Gama Management appreciated STEAG for maintaining the plant to the highest standard and expressed the satisfaction for doing a wonderful job. Various issues along with payment concerns were highlighted.

STEAG and GAMA team celebrated the New Year in plant Premises on December 31, 2022. On the last day of this year 2022, awards for the best employee for the different categories were given away by Mr. Rajiv Dhenge/GGM (O&M-CCPP).

Jharsuguda

Eight engineers of STEAG and two engineers of Vedanta Limited joined ASNT–UT and PAUT – Level II training conducted by A PLUS + NDT from May 2 to 16, 2022.

ASNT–UT and PAUT – Level II training

Seven GETs (14th batch) joined 15 online sessions of AO framework training by PWC initiated by Vedanta Limited in 2022.

AO framework training

Technical training for GETs, safety training, Simulator training, BTG operation on-line training conducted in 2022-2023.

Rewards & Recognition program concluded in 2022 for the following categories:

- Best employee
- Best department
- Best SGA
- Best documentation
- Best Kaizen
- Best enabling department
- Best EHS champion

Rewards and recognition program

Long services awards (10 years / 20 years) concluded in 2022.

Long service awards

SOMC

Yearly cumulative station generation till December 2022 (3556.4 MU) surpassed previous highest (3540.3 MU in FY 2017-18.

Highest ash utilization in a month (December 2022) for FY 2022-23 is 87,918 MT.

Unit #1 overhaul activity performed from November 21 to December 17, 2022. Unit synchronized on December 17, 2022.

Highest monthly station generation (November 2023) for FY 22-23 is 503.5 MU

Highest coal receipts in a month (in November 2022) since COD – 390865 MT (~ 13029 MT/day)

Highest coal receipts in a day since COD – November 8, 2022 (19152 MT).

Environment, Health and Safety (EHS)

We remain committed in 2022 to achieving high standards of safety, as the Health & Safety of our employees, contractors, business partners, and customers is always an agenda for STEAG Energy Services India. We achieved several milestones in Health, Safety & Environment involving all our teams, from top management to the last person on the field. Considering this, SESI has developed and implemented several EHS processes in the field, implemented on the ground, and communicated. Our safety policy is the commitment of our Executive Chairman to ensure everyone reaches home safely and we achieve the goal of the organization of creating a safe and healthy workplace, as no job is so important that we cannot do it safely and without adverse environmental impact.

Jharsuguda

To consider safety at the site, some initiatives taken by the site as routine activities like induction training, job-specific training, TBT (Tool-Box Talk), safety stand-down, monthly inspections of fire prevention equipment, mock drills, safety campaigns, rewards and recognition, internal and external safety audits. Some of the initiatives are:

- Improvement projects on EHS: To reinforce the lone working situation in the TPP, STEAG introduced the GPS tracking device (i.e., personnel monitoring with the additional feature of a panic button) – SOLO (Safety of Lone Operator) for the operator if he goes to the remote location alone, SURAKSHA NIKETAN – Safety Training Center at TPP, training on wheels, introduction of walkie talkies to the teams.

- EHS initiative taken on the occasion of Sankalp Diwas to emphasize environment, health & safety:
  - Motivational speech delivered by the top management of the client and SESI.
  - Safety oath taken to promise one's behavior or actions toward the safety of colleagues and the workplace.

Taking the safety oath

Green card award and gifts given to workers by the senior management on the occasion of Sankalp Diwas.

- Cardiopulmonary resuscitation (CPR) training imparted to employees. CPR is a life-saving technique that is useful in many emergencies, such as a heart attack or near drowning, in which someone's breathing or heartbeat has stopped.

- The safety training hall "Suraksha Niketan" developed in the TPP to develop the skill and knowledge of plant employees on safety management and VSAP module and other job-specific training for employees.

- Safety stand-down conducted on the shop floor, and direct talk with people on the ground. Greatly reciprocated by the people on the ground, who received a message from the senior leadership of SESI and the client team on safety.

HMEL Refinery and PETCHEM, Bathinda

To motivate the site's people, the safety star of the month is celebrated every month. Some Safety initiatives were taken as scheduled activities like Monthly safety briefings, Safety leadership walks, Listening tours, and induction training. Awareness training, Safety Campaigns, etc.

A few highlights are:
The team celebrated National Safety Week from February 25 onward with the theme – "Nurture Young Minds Develop Safety Culture," focused on the effectiveness of IIF SSK (Incident and Injury-Free Supervisor Skill Knowledge) certified supervisors. In this campaign, our key focus is on the efficacy of IIF SSK safety certified supervisors, including "Best Safety practices in the field" and knowledge about the past incidents of CPP and refinery, etc.

"PSM Walkthrough" conducted by HMEL VP (Technical) on May 28, 2022, in the CPP to assess the awareness of workers regarding process safety.

Learning from incidents shared about "Ensure Safe Handover for Maintenance & Repair work," "Minor Explosion in RFG Burner line during Burner modification," and "Ensure Quality Assurance during Fabrication" shared in TBT during pre-job discussion.

External training conducted on Explosion in boilers / ESP.

Five STEAG employees won rewards and recognition in the "Safety" by the client HMEL for third quarter of FY 2021-22.

STEAG achieved a 4-star rating in the annual safety audit for FY 2021-22.

External first-aid training was organized in CPP from April 20 to 24, 2022, and about 120 employees participated actively.

Electrical Safety Week was celebrated from June 26 to July 2, 2022 in the CPP with full zeal and enthusiasm to raise the awareness among employees on electrical safety and to renew the commitment of employees to promote a participative approach towards safe use of electricity. Various competitions like poster drawing competition, safety talk were organized. STEAG employees actively participated in all safety competitions organized by HMEL. 62 employees were rewarded for winning in different competitions and activities.

Electrical safety week

Hazira

Many statutory compliances are renewed this year. Monthly inspections of fire tender, fire detector, deluge valve DV system, and spray system. Safety campaigns, mock drills, and induction training are conducted onsite to motivate and improve safety. Brief highlights are:

A level-2 mock drill to practice how the team would react in the event of a disaster or emergency was organized by our Mutual-Aid Partner (Gujarat Gas Company Ltd.) for emergency services.

A practical demonstration on the subject of "How to generate foam with foam generator".

51st National Safety week celebrated with full of enthusiasm from March 4 to 10, 2022. Various activities were carried out for the whole week as follows:

- Drawing (Poster) Competition for Employee's Children
- Safety Tips – Employee's Spouse Topic : Women Safety

- Hazard Notification & Safety slogan Competition for employees
- First aid training by M/s Pro Safe Process engineer
- PNG gas safety for home By M/s Gujarat Gas(GGCL)
- Demonstration of work at height and confided space equipment
- Online quiz (Through Google form) & Prize Distribution.

National Fire Safety day was celebrated on April 14, 2022. A fire-fighting training was conducted for all Hazira site employees and sub-contractors.

National Fire Safety Day

Completed the ISO 14001:2015 and ISO 45001:2018 certificate renewal audits without any non-conformance.

Attended the fire call in the neighboring village of Moragam as a social service and good neighbor, and extinguished class A fire.

Third-party safety audit and certificate of stability for 351.43 MW CCPP plant done by M/s. D. M. Vaidhya & Associates.

Kashipur

As for safety, the site always focuses on the awareness of its employees. For this, EHS training is conducted from time to time, EHS meetings are conducted every month, and leadership safety walks are conducted on a regular basis. To improve safety awareness among all the team members, EHS training is conducted on topics like. Learning from Incidents, Fire Fighting, Incident Reporting, Confined Space Entry, Earthquake emergency, etc.

Haldia

The safety and well-being of our employees and sub-contractors are our foremost priority. To reiterate our commitment, we organized a **Safety Stand-Down**, a mass safety briefing at the site on January 2, 2023.

The theme for this was **"Importance of safe work & use of PPEs".**

Safety briefing at Haldia

Energy Technologies

With massive opportunities opening up in the environmental sector following the enforcement of stringent pollution control norms, the Energy Technologies team has broken new ground by taking up FGD assignments in the past year. The year also saw the award of solar PV O&M projects in the state of Telangana, which SESI completed successfully. The EPC engineering team has proved its capabilities in this venture and that gives us the foundation for taking up similar assignments in the future with confidence.

Biomass Co-Gen plant Nagda, Lanxess, India

Lanxess intends to setup a new biomass cogeneration plant to fulfill the future demand of process steam and power is required for chemical process plant. After completing FEL-1-conceptual design in 2021, SES was appointed as Owners Engineer for FEL-2 stage engineering and pre-EPC award services in 2022. Service scope covers basic engineering, vendor selection, pre-tendering, tendering and commercial negotiation. SES Germany and India are jointly executing project responsibilities and, at present, tendering for turnkey EPC is in progress. Site visit of SES engineers including experts from Germany is planned in March 2023 for discussion with client personnel and EPC contractors.

Boiler R&M work at 4x600 MW thermal power plant at Jharsuguda

SESI has successfully commissioned the first unit covering comprehensive EPC scope for replacement of economizer coils, combustion modification

and re-heater coils. Engineering, manufacturing and supply of material for both units completed in 2022. Unit #1 boiler lit up and synchronization done in October 2022. The unit has been operated with full load and reached a maximum generation of 610 MW. Presently, tuning of combustion system is in progress using new installed SOFA and latest burners with respect to different load cases and various fuel combinations. PG test will be performed by March 2023 after operational readiness and necessary trail runs.

Phase- II feasibility study for fuel conversion at IEPP at Rabigh, Kingdom of Saudi Arabia- Petro Rabigh

The phase II fuel conversion study aims to select a suitable variant/ option for utilizing sale gas as primary fuel and generating utilities in an efficient and reliable manner. This extensive study includes detailed analysis having multiple options with different variants of GT, preparing thermodynamic models, process and system engineering, all possible load case studies and associated financial models to estimate impact on tariffs considering optimized fuel consumption, reliability, efficiency and to comply with power and steam requirements. Study results are conclusive and have met expectations of both PRC and KSA ministry. SES services for this extensive study is appreciated by RAWEC and PRC.

Assessment of boiler pressure parts at 600 MW boiler in Long phu1, Vietnam

The boiler E&C work is under stalled condition starting from 2016 onwards. Owner wants to resume construction work and has engaged SESI to conduct preliminary assessment of boiler pressure parts condition and its usability, and to recommend further course of actions to complete boiler work. Three experts were deputed at site for visual inspection of pressure parts and two design experts were involved at HO, Noida for design assessment. Assessment report is submitted in November 2022 immediately after the site visit.

Feasibility study review and verification for installation of Quang Ninh LNG To Power project, Vietnam

SESI is appointed by the Institute of Energy, Vietnam to verify the feasibility study and financial models as prepared by PECC1. Scope covers review of basic engineering, general arrangements, selection of critical system and equipment as applicable for LNG terminal, CCGT.

R&M work and AOH of turbine at 12 MW WtE Plant at Gazipur, Delhi, Indo Enviro

The 12 MW WtE plant was installed and commissioned in 2018. Due to major constraints in MSW, the PLF as well as the availability of the plant was very low. During gap analysis study, it was identified that major system and equipment required renovation and overhaul, therefore, the client engaged SESI as the project management consultant for renovation of the plant and equipment, in order to improve plant availability and PLF. Engineering, procurement, inspection, erection and commissioning completed in May 2022. Turbine & auxiliaries AOH successfully executed by SESI and unit was synchronized with maximum generation of 11.8 MW in June 2022. Currently contract closure is in progress.

FGD for 2x660 MW unit, Jharsuguda, OPGC and 800 MW unit, Wanakbori, GSECL

SESI was appointed to provide Owner's engineering and project management consultancy services for installation of wet FGD system. Post-EPC award review engineering and inspection services in progress for OPGC project. For 800 MW Wanakbori, pre-EPC award services is in progress.

Installation of DeNox system for Wanakbori 1x800 MW Gujarat, GSECL

To comply emission norms Owner intends to install DeNox system at 800 MW supercritical unit. SESI was awarded the consultancy services for feasibility study and pre-EPC award services for installation of DeNox system. Technical report submitted after completing site visit, basic engineering and discussion with major OEMs of DeNox system.

110 MW HFO-based combined cycle project, EPVTL, Bangladesh.

It was a first international HFO-based combined cycle project for SESI having project management consultancy responsibilities. After having delay of one year due to pandemic, erection and commissioning was resumed in January 2022. SESI has deputed four engineers for site supervision and filed inspection services.

Simple cycle HFO engines were commissioned in June 2022 and combined cycle unit was successfully commissioned in August 2022. PG test done in September 2022.

Replacement/ retrofitting of combined cycle power plant URAN, Maharashtra, MPPGCL

SESI has been appointed to identify the best possible way forward by choosing the correct options for installation of new combined cycle units in existing space and to interface with current facilities. After necessary assessment, SESI recommended two new F-class machines of 850 MW to be installed in the existing space available in Uran GTPS. Feasibility report, detailed project report and specifications for turnkey EPC execution submitted to the client. Currently pre-tendering and tendering activities are in progress.

RLA study of boiler at IEPP at Rabigh, Kingdom of Saudi Arabia – Petro Rabigh

This is the first RLA study that has been awarded by RAWEC for a single boiler at Rabigh IEPP. Project was executed successfully in June 2022.

2x65 MW captive co-generation plant at Dahej, Gujarat, GACL-NALCO

SESI has been engaged for review engineering and construction supervision works till final commissioning of the plant. Sixteen experts were deputed at site for field inspection, construction supervision and E&C activities. Unit #1 is successfully commissioned and achieved target load in May 2022. Unit #2 commissioning work is in progress and it is planned for synchronization in March 2023.

Gap analysis and RLA study of 2x125 MW Giral Lignite Power Plant (GLPL), (RRVUNL), Jaipur

Units were under stalled condition from 2016 onwards. Owner wanted to revive both units and engaged SESI for conducting comprehensive assessment of plant, systems and equipment. STEAG team comprising of engineering, RLA experts were visited site for 20 days to conduct gap analysis and RLA tests. A comprehensive report including gap analysis, RLA study and tentative cost impact shall be submitted for a budget preparation of R&M works.

Technical Services and Quality

In the present scenario, it is imperative for the power plant owners to focus on making their plants more efficient and reliable. With this trend, the demand for testing and diagnostic services are growing exponentially. To cater to this requirement, our experts from "Technical Services and Quality" offer a wide range of these services including performance guarantee testing, energy audit and other comprehensive testing of machines, equipment and consumables. We ensure that power plants remain compliant with safety and operational standards and continue to operate with better efficiency and reliability. We also provide technical solutions, training & support for quality-related issues, inspection, non-destructive testing and so on.

Key activities of Technical Services and Quality in 2022 were:

Energy audit of power plants, operation and efficiency improvement services, baseline tests, water balance studies, PG test, heat rate improvement studies, transformer oil testing, etc.

Major crack in tube mill shell 1 C at Vedanta, Jharsuguda repaired successfully.

Progress monitoring and condition appraisal software, developed by M/s. Maximl jointly with Vedanta and STEAG Quality Team implemented successfully at Vedanta, Jharsuguda, during COH #1.

During 2022, ASNT Level II training and certification Courses organized for STEAG engineers through ASNT approved NDT Institutes. 11 engineers have been certified for RT, PT, MPI, UT and PAUT. Five engineers have been certified for UT and PAUT.

Successfully implemented the NDT technique of PAUT (Phased Array Ultrasonic Testing) in boiler economizer coils weld joints during R&M #1 (4x600 MW) VL, Jharsuguda. We could establish that the PAUT is faster and accurate in weld defect identification. Unlike radiography, there is no radiation hazard during testing.

Delivered online training session on Quality Management, Contract Management and Maintenance to external customers.

A classroom training was delivered at GETRI, Vadodara (to participants from various power plants) by Mr. Vijay Sachdev on October 17 and 18, 2022 on

"Condition-Based Monitoring and Maintenance in Power Plants".

Training at GETRI

A study tour conducted for Bangladesh delegates from October 14 to 20, 2022. A training session was conducted for them at the STEAG Excellence Center, Kochi.

Study tour for Bangladesh delegates

Training & Advisory

In the post-COVID situation, the focus is shifting back to conventional classroom training due to its high effectiveness. Besides, paid webinars and online training programs for external customers are also being conducted intermittently on contemporary issues and topics. Simulator training through remote mode is continued, as it provides flexibility to attend from different locations. International seminars and workshops are also being planned / organized.

Ministry of Power (T&R Section) granted renewal of recognition to STEAG Power Plant Learning Center of STEAG India. A team of CEA officers audited the center to assess the requisite facilities for meeting requirements of recognition as per provisions of CEA Regulations 2010. The center is recognized as Category-I institute and renewal is granted for imparting training in Operation & Maintenance of thermal power plants for next 4 years with effect from September 1, 2022.

IGEF, STEAG Energy Services India, KWS Energy Knowledge eG (training center in Germany) and vgbe organized a 5-day remote simulator training program on flexible power plant operation from July 4 to 8 2022 at the STEAG Learning Center, Noida. The objective was to develop "FLEXPERTS". Experts from NTPC, DVC, PMI, and Tata Power participated in the training program.

Training program on flexible power plant operation

Online competence development program conducted for SS Power I Ltd. Bangladesh on 660 MW supercritical power plant familiarization and operational aspects and **"Testing, Commissioning and Operational aspect of 660 MW Supercritical Power Plant"** from January 2 to 22, 2022. The training program included online theoretical as well as Simulator-based training sessions.

Training program for SS Power I Ltd., Bangladesh

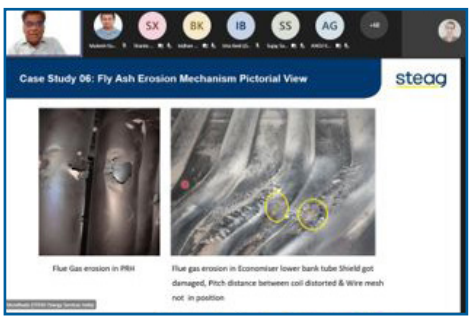
Online training programs organized for DVC on:

- Root cause analysis of tripping,
- Power plant performance analysis and optimization,
- New technologies and trends of ash handling plant and utilizing pond ash,
- Understanding Chinese steam turbine sets in reference to KWU design,
- Ambient air quality monitoring system,
- Ambient air quality norms and registration in the CPCB portal,
- Condition-based monitoring etc.

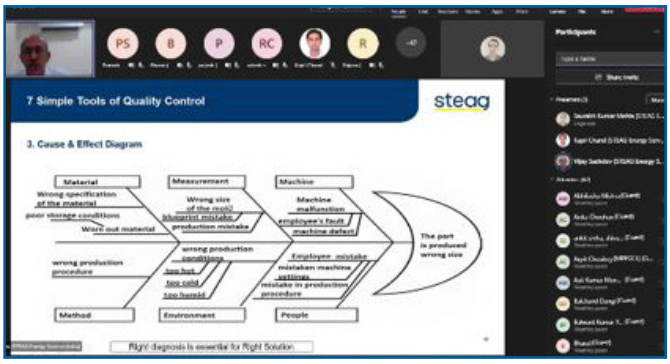
Online paid training programs conducted at PAN India level on specialized topics like:

- Execution of mega power projects – challenges & mitigation,
- Boiler tube failure: Mechanisms, corrective & preventive actions,
- Quality management in coal and gas-based power plants,
- Best practices for efficiency enhancement in coal-based power plants,
- Best practices to minimize APC in coal-based power plants,
- Contract management in power plants: Technical and key perspectives, etc.
- Condition-based monitoring etc.

Participants from MPPGCL, WBPDCL, MAHAGENCO, NALCO, NGSL, Shree Cement Ltd, Jindal India Thermal Power Limited, DVC, NTPC, Jindal Power & Steel, NGSL, Adani Power, L&T and various other organizations across India attended with interactive Q&A sessions. Programs were well appreciated by attendees.



Online paid training program on "Boiler tube failure: Mechanisms, corrective & preventive actions"



Online paid training program on quality management in coal and gas-based power plants

Simulator training programs conducted in remote mode for engineers at HMEL, VL-JSG, SOMC Vizag and Kashipur sites.

Three days full-fledged classroom training program organized from June 3 to 5, 2022 for 15 STEAG India trainers on "Train the Trainer".

Train the Trainer program

Competency development training programs organized successfully for Technicians from FieldCore (GE). Participants from Iran, Egypt, Algeria, Oman, Dubai, Ghana, Philippines etc. attended the program with very positive feedback.

Competency Development Training Program

Training sessions organized for GETRI on:

- Flexibilization of thermal power plants,
- Power/control/instrument cable selection, installation, testing, maintenance, fault finding, protections, damage mechanisms
- Inspection and RLA of steam turbine components,
- Switchyard protection and maintenance,
- Coal/lignite sampling and quality assessment etc.

Training program for GETRI

On-site classroom training program conducted for Shree Cement Ltd, at Ras and Beawar Sites, on Reliability Improvement through Condition Monitoring, Steam Turbine Governing & Its Auxiliaries Operation, CFBC Boiler & its Auxiliaries Operation, Bearing Maintenance & Shaft Alignment etc. with very positive feedback.

On-site classroom training

Webinars organized on "Performance & Predictive Analysis of Thermal Power Plants with Thermodynamic Tool and ML Computing" and "Developments and Advancements in Renewable Energy Technologies to Mitigate Environmental Damage". More than 200 participants from prestigious organizations attended with very positive feedback.

As per the corporate training calendar, programs organized for STEAG HO employees on Interpersonal skills, Corporate Design Guidelines, QMS and Quality Policy, Personality Development, and Contract Management.

A training program was conducted by trainers of STEAG Energy Services India for power plant experts of VIRA (Vietnam Reliability and Asset Management Energy JSC) from December 10 to 15, 2022. The program was organized at the STEAG Head Office, Essen, Germany under the contract received from STEAG Energy Services GmbH. The training focused on combustion optimization covering operational aspects of Chinese built coal-fired generating units

Training program for Vietnam in Germany

Systems Technology

In addition to the expansion of AMC arrangements with various utilities, the Systems Technology department has successfully moved into PADO upgrades (upgrade acquisition for three sites been done in 2022) market using existing significant PADO installed base. Apart from expansion of AMC arrangements with various utilities (RAWEC, KSA is the new addition in 2022), Simulator execution progress was significant including achieving Completion of Facility (COF) of 11 Simulators at the NTPC Sholapur location. Diversification into bio-mass Simulator project in Vietnam and ongoing simulation studies into captive power plant (Haldia) connected with the petrochemical complex was another achievement in 2022 for the Simulator division. Power System Simulation Division (DigSILENT software) achieved significant momentum by achieving projects from new customers like Power Grid, JEF Techno Solutions & Hitachi Energy Chennai. EBSILON upgrades in MAHAGENCO (6), Aditya Birla (2) were other significant events in 2022. Breakthrough in digitalization is expected shortly and we are confident that our activities in the digitalization space (especially with Fleet Monitoring) will be significant in the coming year.

NTPC LARA PADO (2x800 MW) Unit #1, #2:

Team consisting of Mr. Subrat Mishra, Ms. Sweta Pradhan, Mr. Rajbans Talwar and Mr. Praveen Ambastha visited NTPC LARA from January 3 to 8, 2022 for the commissioning and pre-SAT demonstration. The pre-SAT demonstration was completed successfully. There is one dedicated LVS in the control room to monitor PADO results in each shift. The shift engineer maintains a log book as per the results of PADO. SR1 online report (life-time monitoring reports of thick component of boiler) developed to monitor the fatigue developed in the boiler in each shift/day/week due to high ramp up – ramp down of the load. It was well appreciated by NTPC officials.

NTPC Solapur Training Center:

Factory acceptance test of NTPC Telangana 800 MW simulator completed successfully on January 18, 2022. The NTPC Telangana team participated in the testing from the Telangana site using remote connectivity software application.

NTPC Gadarwara PADO (2x800 MW) Unit #1 and #2:

Team consisting of Mr. Kamal and Mr. Vinay Shende visited NTPC Gadarwara from February 9 to 22, 2022 for SAT (Site Acceptance Test) and handover of Unit #1 and #2 PADO. SAT/handover of Unit #1 and #2 PADO completed successfully.

Supply of DigSILENT PowerFactory software and training:

Received a PO from AKER Solutions to supply PowerFactory licenses and training on February 15, 2022.

Training on DigSILENT PowerFactory software:

Received a PO from SIEMENS GAMESA, Bangalore to provide training on PowerFactory software on March 3, 2022.

Bongaigoan PADO (3x250 MW) Units #1, #2, and #3:

Team members Mr. Kamal Sardana and Mr. Lokesh Sinha visited from February 27 to March 5, 2022 for SAT of PADO Units #1, #2, and #3. SAT (Site Acceptance Test) of PADO Units #1, #2, and #3 completed successfully. Team members from Noida office Mr. Jatinder Singh and Mr. Subrat Mishra provided remote support during SAT.

Supply of DigSILENT PowerFactory software and training:

Received a PO from SGURRENERGY India Pvt Ltd. to supply PowerFactory licenses and training on April 21, 2022.

TSGENCO Kothagudam PADO (1x800 MW) Unit #12:

Team members Mr. Praveen Ambastha and Mr. Ashutosh Ranjan along with BHEL EDN Engineer visited the Kothagudam site in mid-April for handover. The visit was very successful, but the system is kept under observation for 4 weeks by TSGENCO. After continuous follow-up and remote demonstration on the punch points of PADO system, the PADO System was handed over to TSGENCO Kothagudam.

TSGENCO Kothagudam PADO training at Noida Office:

Five officials from TSGENCO visited the Noida office to attend a five-day PADO training from May 30 to June 03, 2022, All PADO team members along with the HOD ST – Mr. Debasish Patra were present in the inaugural session. Dr. Tomasz Kaminski and Mr. Amit Joel from BHEL EDN joined remotely for inaugural session.

PADO training for TSGENCO Kothagudam

Toshiba Harduaganj 660 MW Simulator:

Commissioning activities of the simulator started. Mr. Abhijit Sahu and Mr. Saurabh Sharma visited the Harduganj site for the commissioning activities.

Training of DigSILENT PowerFactory software:

The STEAG team is providing training to SGURR Energy on the PowerFactory software. Team members consisting of Dr. Vedika Agrawal, Mr. Naveen Kumar and Mr. Tom are conducting training for two days from May 31 and June 01, 2022.

BRBCL, Nabinagar (4x250 MW):

Team consisting of Mr. Ashutosh Ranjan and Ms. Sweta Pradhan visited the Nabinagar site from June 14 to 23, 2022 to complete the commissioning and handover/SAT. During the visit, the handover/SAT of Units #1 and #2 completed successfully and the commissioning of Units #3 and #4 completed. Handover of Units #3 and #4 will be done in the next visit after completion of observation period.

NTPC Solapur Simulators:

The Simulator team has successfully achieved the "Competition of facility" for 8 Simulators (plant reference Solapur, Meja, Tanda, Barh-2, Lara, Kudgi, Gadarwara and Darlipalli).

RRVUNL, Suratgarh (2x660 MW) Unit #7, #8:

Team consisting of Mr. Ashutosh Ranjan and Ms. Sweta Pradhan visited the Suratgarh site from July 18 to 23, 2022 to complete the commissioning and handover/SAT. During the visit, the handover/SAT of Unit #7 and commissioning of Unit #8 completed successfully.

CSPGCL, Marwa (2x500 MW) Unit #1, #2:

Team consisting of Mr. Yogesh Arora and Mr. Nikhil Tembhare visited the CSPGCL, Marwa site for upgrading the PADO hardware and software for Unit #1 and #2. Upgrade under progress at the site.

Training of DigSILENT PowerFactory software:

The STEAG team provided training to MTU India Pvt. Ltd. on the PowerFactory software. Team consisting of Dr. Vedika Agrawal and Dr. Samiuddin Ahmed conducted a five-day training in two sessions i.e., from July 12 to 14 and from July 18 to 19, 2022.

Training of DigSILENT PowerFactory software:

The STEAG team provided training to MTU India Pvt. Ltd. on the PowerFactory software. Team consisting of Dr. Vedika Agrawal and Dr. Samiuddin Ahmed conducted a five-day training in two sessions i.e., from July 12 to 14 and from July 18 to 19, 2022.

Power Grid Corporation of India Ltd.

PO received from Powergrid on August 5, 2022 for supply of electrical system study software (DigSILENT PowerFactory software) with 3 years additional AMC.

Hitachi Energy Technology Services P. Ltd. Chennai:

PO received from Hitachi Energy on August 15, 2022 for supply of 2 DigSILENT PowerFactory multi-user licenses of unlimited busbars.

JEF Techno Solutions Pvt. Ltd.:

PO received from JEF techno on August 22, 2022 for supply and installation of DigSILENT PowerFactory software single user workstation license of unlimited busbars.

RVUNL Suratgarh, Units #7 and #8 (2x660 MW):

Team members Mr. Ashutosh Ranjan and Ms. Sweta Pradhan visited RVUNL Suratgarh from September 19 to 22, 2022 for SAT and handover of Unit #8. SAT and handover of Unit #8 completed successfully.

Chandrapur STPS (2x500 MW) Units #8 and #9:

Team members Mr. Praveen Ambastha and Mr. Nikhil Tembhare visited the Chandrapur STPS from October 17 to 22, 2022 for upgrading PADO of Unit #8 and demonstrating the PADO Unit #8 output. Upgrade of PADO Units #8 and #9 completed successfully. Mr. Ashutosh Ranjan supported remotely during the upgrade.

Koradi Training Center, Koradi:

Team members Ms. Sweta Pradhan and Mr. Monu Shrivastava visited the Koradi training center from November 14 to 19, 2022 to provide training on the EBSILON software to the 2nd batch of Mahagenco officials. Around 22 engineers from different sites (Koradi, Khaperkeda, Parli, Paras, Uran, Chandrapur) attended the training program. The main aim of the training was to use the EBSILON software for gap analysis and to optimize the heat rate of Mahagenco units.

NTPC Nabinagar Phase I (4x250 MW) and Phase II (3x660 MW):

Team members Mr. Nikhil Tembhare, Mr. Ashutosh Ranjan and Mr. Praveen Ambastha along with BHEL EDN engineers visited the NTPC Nabinagar site from November 28 to December 03, 2022 to complete the SAT and handover of Phase I and II PADO. SAT and handover of PADO Phase I and II completed successfully.

EBSILON Training to Aditya Birla Hindalco:

Team members Mr. Abhik Das and Mr. Mohit Sanoria visited the Aditya Alumina Lapanga CPP from December 5 to 9, 2022 for imparting EBSILON training to the officials of Hindalco CPP. Eight to ten engineers from Hindalco CPP attended the hands-on training. The training was very successful.

T&D and Project Development

A major breakthrough was achieved by the award and satisfactory execution of T&D assignments in Bangladesh, which was a collaborative effort between the T&D department, the ET and ST departments. Significant investments are expected in T&D in India and South Asia in the coming years and appropriate organizational changes have been made to enhance the status and structure of the T&D department to fully capitalize on the opportunities in this field.

Major orders booked in 2022:

PwC

TEV study for 2x300 + 2x660 MW LANCO Amarkantak Power Limited.

Nuclear Power Corporation of India Limited

Consultancy assignment for advising sale of power directly to prospective customers from nuclear power plants.

Power Cell, Bangladesh

Feasibility study for multipurpose use of land for renewable energy projects in Bangladesh.

Technical study for innovative designing of Bangladesh Grid transmission towers of Power Grid Corporation of Bangladesh by optimizing land use area.

Aditya Birla Finance Ltd.

Developing allied infrastructure and intercity bus services for deployment of 50 electric buses in the state of Maharashtra.

REC Corporation

Project Management Services for 400 kV Udupi Kasargode transmission line (establishment of transmission system in Karnataka, Kerala corridor).

Deloitte

Technical due diligence of 2x600 MW Athena power plant of Vedanta Power Ltd at Chhattisgarh.

Power Finance Corporation

Monitoring of operation and maintenance of 2x48 MW of Jorethang loop hydroelectric power plant of DANS Energy Power Ltd in Sikkim.

Monitoring of operation and maintenance of 2x48 MW of Tashiding hydroelectric power plant of Shiga Energy Power Ltd in Sikkim.

Project management services as PMA for 2x660 MW coal-fired thermal power project of Jhajjar Power Ltd., Haryana.

Project management services as PMA for 2x700 MW coal-fired Nabha TPP of L&T in Punjab.

Project management services as PMA for implementation of 50 MLD tertiary treatment plant of Chandrapur Waste Water Management Pvt. Ltd.

Assignments undertaken in 2022

Songas Ltd, Tanzania

Consultancy assignment for advising sale of power directly to prospective customers from nuclear power plants.

Power Finance Corporation

Developing allied infrastructure and intra city bus services for deployment of 350 electric buses in the state of Uttar Pradesh.

Lender's Engineer for 220/400 kV transmission lines of VAPI-II North Lakhimpur Transmission Ltd.

TANGEDCO

Asset valuation for 2x60 MW + 3x110 MW Ennore thermal power station coal-based at Ennore, Chennai.

Nilanchal Power Pvt. Ltd.

Reconciliation and condition assessment for 1x350 MW thermal power plant at Kandarei, District Cuttack, Odisha – KVK.

Power Cell, Bangladesh

Conducted second stakeholder's workshop on feasibility study for multipurpose use of land for renewable energy project in Bangladesh.

Lanco Anpara Power Ltd.

Feasibility study for biomass co-firing in 2x600 MW Anpara 'C' TPS.

Bangladesh Rural Electrification Board

Training of BREB and PBS officials conducted on the various aspects of underground distribution system including training on CYME and GIS software at Dhaka for conversion of overhead distribution system of Narsingdi PBS-1 and Gazipur PBS-2 to underground distribution system.

Human Resources

This year we have launched the new HR software to make our HR process more flexible starting with attendance / leave systems. All other process are going to be integrated in phased manner this year. Further, keeping in view of growing health concerns post pandemic, we have associated with Medi Buddy to provide unlimited online doctor consultations for all STEAG employees and their family and also enhanced new features & more coverage for parents in our existing Mediclaim insurance policy. For the first time in STEAG, we had major takeover of staff of more than 900+ employees at the Jharsuguda site from our sub-contractor (500+ on our direct rolls and remaining through our onboarding agency), which our HR team along with all site management support successfully completed. Various organizational development interventions are being planned to have smooth integration and address the challenges envisaged with this takeover of staff at Jharsuguda.

International Women's Day (IWD)

The International Women's Day (IWD) is a global event celebrated annually on March 8 to commemorate the cultural, political, and socio-economic achievements of women.

This year we had arranged for a sixty (60) minutes online interactive session on March 8, 2022, in which the doctor, Dr. Srishti Pathak (BHMS, MD), currently practicing at Homeo Amigo, a homeopathy clinic in New Delhi and Noida, discussed about lifestyle, healthy dietary habits and nutrition-related topics of women. She also addressed the concerns of the participants at the end of the session. Mr. Ashish Malik, CFO also addressed the gathering at the beginning of the session. We also arranged for a small tokens of appreciation, which were gifted to all our female employees.

Special arrangements (get-together of female colleagues) was also organized at Jharsuguda and Noida office.

International Women's Day celebrations

Resumption of physical monthly get-togethers

With the abatement of COVID cases, the monthly get-togethers have resumed at the Noida office with masking protocols being followed. On this occasion, Dr. J. T. Verghese addressed the staff at the Noida office on September 29, 2022. Highlights of the ongoing restructuring process at STEAG Germany were explained and questions raised by the employees were clarified.

Dr. Verghese addressing the employees

Medical camp at Noida

A medical camp was organized in our office premises on September 5, 2022. Representatives and doctors from Emedlife and Redcliffe Labs were present. Basic tests like BMI, random sugar testing, height, weight and ECG along with doctor consultation were done and there was a good turnout at the camp.

Health check-up of employees at the medical camp

Diwali Celebrations – Noida Office

After the easing of COVID 19 social restrictions, Diwali was celebrated in our Noida Corporate office on October 21, 2022. The festival of lights was celebrated with fun events and the festive spirit was evident as most of the staff members were decked in traditional attire (ethnic wear). Our office was lit up with colorful lights. The gathering concluded with prize distribution for the fun events and best dressed employees in ethnic wear followed by sweets distribution to all our staff members.

Diwali celebrations at Noida HO

Webinars on spinal issues and ergonomics at workplace

The spine gives our body structure and support. It allows one to move about freely and to bend with flexibility. Back pain is one of the most common work-related injuries and is often caused by ordinary work activities such as sitting in an office chair or heavy lifting. Keeping this in mind, two webinars were conducted in this month on the following topics:

- Spinal issues: This webinar was conducted on November 17, 2022 by Dr. Anurag Saxena, Head of the Department of Neurosurgery at the Manipal Hospital.

- Ergonomics at workplace: This webinar was conducted on November 25, 2022 by Dr. Saurabh Chachan, Senior Consultant at Jaypee Hospital.

Both the doctors conducted an hour long informative session wherein basics and preventive measures discussed in detail. They also held a Q&A session with the employees and answered their queries.

Session on POSH

A session on Prevention of Sexual Harassment at Workplace (POSH) was held on December 13, 2022 for all the new joiners. The aim of the session was to sensitize them on the different aspects of the POSH policy, its significance and implications. Another session was held for the ICC members on December 9, 2022, in which different aspects of the policy and act were discussed with the ICC members. Both sessions were conducted by the external ICC member Advocate Madhuri Bakshi.

Session on POSH

Employee Contributions

Aatmanirbhar Bharat

Self-reliance in energy through green hydrogen

P. K. Guin
Site Incharge
SESI Barauni

As the demand for energy rises worldwide, there is a growing need for tapping alternate energy sources that are not only greener but also renewable and abundant in supply. Hydrogen is one such source that has a much higher energy output per unit mass.

The Green Hydrogen, with zero CO2 footprint, is the fuel of future. Coal and all other fossil fuels will be gradually displaced by hydrogen in future.

Almost all (95%) of the present hydrogen is produced from hydrocarbons and is responsible for the CO2 emission. However, there is a non-polluting alternative, the green hydrogen (approx. 4% of the total production at present). It is a non-polluting alternative obtained through the electrolysis of water. Electricity is required for this process, so if the generation of electricity is done from renewable sources, the hydrogen will be obtained without any CO2 emission - the Green Hydrogen.

The hydrogen production is in its nascent stage and there remains a lot of uncertainty surrounding its safety, etc. It is important to deliberate and understand the legal & regulatory requirements, investment cases, financing structure, operational requirements and other elements that need to be considered to formulate an effective and acceptable commercialization model. A gradual transition with adequate policy and safety standards will help build confidence and provide a conducive environment for a hydrogen-based economy.

Green Hydrogen – India's Sunrise Sector

In-line with India's ambitious green hydrogen commitments, the Indian government aims to transform India into an energy-independent nation by 2047, where green hydrogen will play an active role as an alternate option to fossil-based fuels.

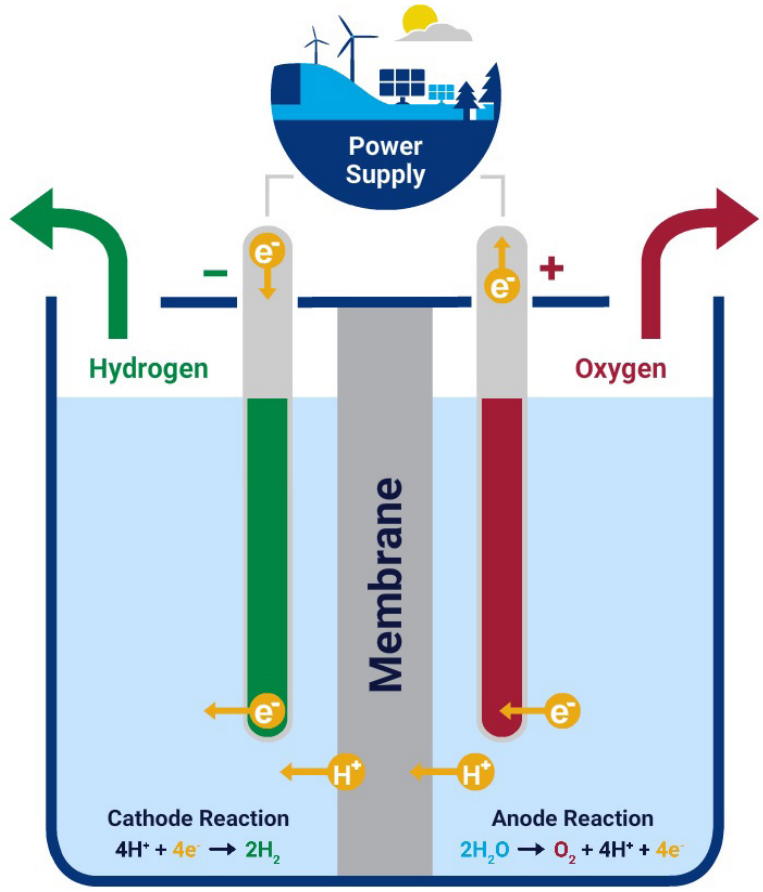
In 2020 (as per TERI report), India's hydrogen demand stood at 6 million tons (MT) per year. It is estimated that by 2030, the hydrogen cost will go down by 50%. The demand of hydrogen is expected to see a 5-fold jump to 28 million tons by 2050 and many Indian companies like GAIL, RIL, IOCL, L&T have already started announcing their plan to dip their toes in the green hydrogen sub sector.

Ohmium International, through its subsidiary in India, has started manufacturing electrolyzers in their Bangalore facility, which is India's first green hydrogen electrolyzer giga-factory.

However, in India, there is a shortage of qualified technocrats, who can install, operate and maintain the hydrogen system. Centers of excellence are the need of the hour, in order to have capacity building in the entire value-chain in hydrogen.

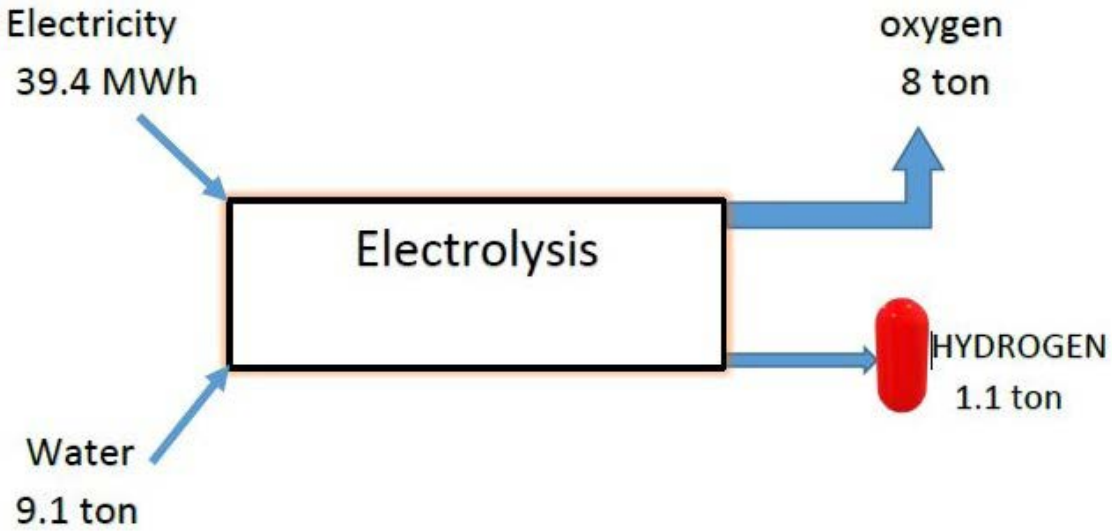
India's journey into the green hydrogen space has been path-breaking. At present, the industry is facing high production costs, but owing to increased demand, technology upgrade and strong institutional support, the industry will soon establish economy of scale, driving down the cost of production.

In-line with India's "Make in India" initiative and its zero emission target, the green hydrogen sub sector provides tremendous scope for growth and investment.



Fundamentals of green hydrogen production through electrolysis.

Newer hydrogen production method with no greenhouse gas pollution



1.1 tons of hydrogen = $1,497
(Wholesale electricity USEIA 2019)
Avg. price in 2019 $ 1.0 = Rs 70.40

Hydrogen Storage, Transportation Challenges

Kalpesh H. Prajapati
Senior Officer, EHS
Hazira

Hydrogen has a significant potential to decarbonize energy consumption. However, to achieve this potential, several obstacles around hydrogen storage, transportation and distribution must be overcome.

Key challenges to hydrogen delivery include **reducing cost, increasing energy efficiency, maintaining hydrogen purity, and minimizing hydrogen leakage.**

Hydrogen is a much lighter gas than gasoline, which makes it difficult to store and transport. To be able to store it, we need to compress it into a liquid and store it at a low temperature. The high pressure needed to store hydrogen makes it a difficult fuel to transport in large quantities.

Hydrogen storage and distribution technologies: Tanks and trailers

Perhaps the biggest challenge of developing hydrogen energy capabilities is that the gas has an extremely low volumetric density – at 3.2 times lower than natural gas, and 2,700 times lower than gasoline. Hydrogen must therefore be compressed or liquefied to be cost-competitive with other forms of energy. However, achieving this presents a number of technical challenges and difficulties:

- Hazards – compressed hydrogen can be explosive
- Hydrogen liquefies at -253°C, making this an energy-intensive form of storage
- Regulations for hydrogen storage vary significantly around the world
- Mixing hydrogen safely with natural gas in pipelines is a challenge
- Damage – hydrogen can embrittle components and storage materials

Hydrogen is a highly inflammable substance and explosive in nature; **it cannot be easily transported from one place to another.** It can be generated by the hydrolysis of water, but it is a very expensive process.

Efficiencies range from **approximately 30% for gas turbines and up to 60% for large scale combined-cycle plants.**

Hydrogen is difficult to store due to its low volumetric energy density. It is the lightest and simplest of all elements, being lighter than helium, and so is easily lost into the atmosphere.

Hydrogen is commonly transported and delivered as a liquid when high-volume transport is needed in the absence of pipelines. To liquefy hydrogen it must be cooled to cryogenic temperatures through a liquefaction process. Trucks transporting liquid hydrogen are referred to as liquid tankers.

The options to transport pure hydrogen are liquid hydrogen and Liquid Organic Hydrogen Carriers (LOHC), but firstly, **the energy consumption for the conversion process is too large and secondly,** all the associated equipment is expensive, "liquid hydrogen in particular" says Blanco.

Obstacle for hydrogen fueled vehicles
If there are **no hydrogen refueling stations,** consumers cannot conveniently fill up, and hydrogen is hard to store and transport both in the vehicle itself and where it is produced. Clean hydrogen requires electricity to make and remains relatively expensive, when used for power generation, as in a fuel cell

Conclusion
Using hydrogen storage to balance the grid discourages fossil-fuel energy generation and encourages renewable generation. This has many benefits, such as lower emissions and cleaner air.

Long Service Awards

Employees with 20 years of service

It's a pleasure and honor to work with this esteemed organization. The company has given me the opportunity to work and I tried to give my level best. I am grateful and thankful to the company, the management and my colleagues for all the opportunities, recognition, growth & kind support. Thank you very much.

Vinod J. Patel
Hazira

I want to sincerely thank the SESI management for recognizing my long association with it. During this period, I have always felt as a part of a growing institution. I want to congratulate other colleagues as well and wish them a happy and prosperous new year.

Vijay B. Patel
Hazira

I have been working with STEAG for 20 years. My experience in STEAG has been so much enjoyable, thanks to all the staff members of STEAG for support.

Samir J. Jani
Hazira

I feel privileged for my association with STEAG for 20 years and support from my colleagues and especially the leaders of the company.

Dinesh A. Patel
Hazira

Employees with 20 years of service

I feel proud to be a family member of STEAG and completing 20 years of my services. I do not know how fast these years passed. But one thing is sure that these all years were incredible for me.

Ratan Ghosh
Noida

It is really a blessed moment for me after completing 20 years of service in STEAG and I feel greatly honored to be part of STEAG family. I express my sincere gratitude for the guidance and motivation provided by the management and seniors and also the support of my colleagues at every stage.

Sincerely wish that STEAG create new benchmarks of performances and excels in every sphere of its activity. As we move forward, I take this opportunity to wish good health and prosperity to everyone in STEAG family.

Joseph V. V.
Noida

Feel proud and honored to be associated with the STEAG family for the last 20 years and learned a lot from seniors and other colleagues at different sites and in different departments. I wish STEAG to achieve its vision to be the most admired and responsible energy service company delivering sustainable value to all stakeholders and contributing towards mitigation of environmental impacts of energy production and use.

Sabu Augustine
Noida

I have been working with STEAG for 20 years now. My experience in STEAG has been so much enjoyable, thanks to all the staff members of STEAG for support.

Ram Dutt
Noida

Employees with 15 years of service

I have completed 15 years long association with Steag family and its very enjoyable time and feeling proud, I joined STEAG Hazira as a mechanical maintenance engineer on 14.05.2007. I have learned so many things from our esteemed organization by full co-operation from superiors and all staff members. also my standard of living is improved while working at STEAG. I am very thankful to the STEAG management especially to Sr. ED Mr. M. K. Gupta, Mr. D. V. Mahida and Mr. Jitendra Gandhi.

Kishor D. Patel
Hazira

It is a great honor for me to receive this special award. I would like to thank the STEAG management, my bosses and all of my dear colleagues, who believed in me and joined me in this unforgettable journey! I really feel privileged to be part of the STEAG team. I wish everyone a very happy & prosperous New Year & I wish STEAG continued success in years to come!

Jitendra Ishvarbhai Gandhi
Hazira

I Naresh V Patil, am very grateful to STEAG Energy Services (India) Pvt. Ltd. to give me opportunity to serve and to enhance my knowledge as combined-cycle power plant engineer over 15 years' service. I am very thankful to STEAG Energy Services (India) Pvt. Ltd. to give me Long Service Award for my journey with the company with loyalty & dedication to my duty.

Naresh V. Patil
Hazira

Employees with 15 years of service

Firstly, I am delighted for giving me such respect and it is a great honor for me to receive this special award. I believe this award will improve me. It gives me purpose and zeal to improve my work, and I guarantee to put more effort in the future. I would like to thank all of my dear colleagues who believed in me and joined me in this unforgettable journey! Also, I would like to thank the STEAG management for the inspiration, motivation, and encouragement given throughout the years. I know STEAG will continue to inspire us for many years to come!

Arvind R. Patil
Hazira

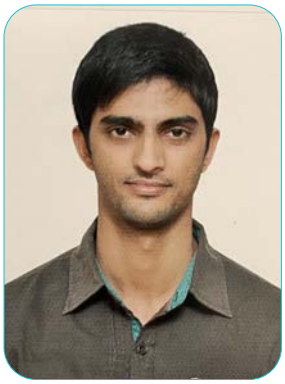
I, Bharat Savaliya, am very grateful to STEAG Energy Services (India) Pvt. Ltd to give me opportunity to serve and enhance my knowledge as combined-cycle power plant engineer over 15 years' service. I am very thankful to STEAG Energy Services to give me the long service award for my journey with the company with loyalty and dedication to my duty.

Bharat Laljibhai Savaliya
Hazira

I am Bhavesh Nayak working in Operations department at the Hazira site. I want to convey my sincere thanks to STEAG for my 15 years of work. It's been a great pleasure to work on technical and non-technical aspects It's been a great professional environment to work in the organization. I am thankful to Mr. R. K. Mishra, who always supported me at professional and personal levels. I am also grateful and thankful to Mr. M. K. Gupta as he always remains a stepping stone to my knowledge growth. I am grateful to the STEAG Management for choosing me to work and always supported me as STEAG family. Lastly I am very much grateful to Dr. J. T. Verghese, who is the inspiration for STEAG India and STEAG family.

Bhavesh D. Nayak
Hazira

Employees with 15 years of service



I am Gaurang M Joshi. I have worked for 15 years with the STEAG family. I always feel that words are not enough to thank for everything STEAG has done for us. We feel privileged to be part of the STEAG team. Your leadership is exceptional. Working with a wonderful company like you has been a fulfilling experience. I have learned a lot from your drive and tenacity to excel. Thank you once again.

Gaurang Madhusudan Joshi
Hazira

I feel really grateful when I look back to my journey of 15 years with STEAG. It all started in SESI at site GSEG CCPP, Hazira, Gujrat in the year 2007. Then my journey took me to HMEL Refinery CPP Bhatinda, Punjab and finally to Noida. In the course of my journey, related to work ranging from operation, maintenance, commissioning and TSQ, I feel thankful to all my teammates, colleagues and seniors. I was constantly given the chance by STEAG to advance my knowledge, take on difficult tasks and even manage a team of my own. I've had the privilege of working with some of our industry's most knowledgeable and skilled individuals. It's been a remarkable experience, and I'm honored to work for company that consistently works on pursuing excellence. I have a lot of incredible memories over the last fifteen years, and I want to have many more in the years to come. Thanks for your continued support!

Lalit Kumar
Noida

I feel privileged for my association with STEAG and support, love and respect from my colleagues and especially the leaders of the company.

Mohan Chandra
Noida

Employees with 15 years of service

I boarded STEAG in September 2007 at the Goa O&M site in the Mechanical Maintenance department. Thereafter, I came to Engineering/ET division at Noida and still continuing. The journey so far was exciting as well as a great learning experience. In the course of time, I got many opportunities to work in different projects with various clients and varying degree of challenges. During the journey, I witnessed the organization grow and had the opportunity to grow with the organization. I thank all my colleagues and the management for their support throughout.

Sudeep M. Sekhar
Noida

This is a very proud moment for me. When I look back, it has been a long journey of 15 years, but actually it never felt such long due to the nice and supportive people always around. Thanks to each and every member of the STEAG family, who remained associated with me throughout this journey. It has been a great experience to work with STEAG and I look forward to continue giving my best and see our company achieve greater heights.

Arvind Kannojia
Noida

Employees with 10 years of service

Surendra Verma
Bathinda

Ashok Kumar Mehta
Kashipur

Abhik Kumar Das
Bathinda

Ghanshyam Tak
Bathinda

Aurobinda Behera
Jharsuguda

Arnab Srimani
Jharsuguda

K. V. V. Prasad Rao
Jharsuguda

Harihar Mohanty
Jharsuguda

Krityanand Choudary
Jharsuguda

Pankaj Arora
Bathinda

Ashish Anand
Jharsuguda

Sanjay Singh
Jharsuguda

Employees with 10 years of service

Sunny Kumar
Bathinda

Baljinder Singh
Bathinda

Mohit Goyal
Bathinda

Pawan Singh
Jharsuguda

Gursewak Singh
Bathinda

Rajnish Kumar
Bathinda

Kamal L Sahu
Jharsuguda

Raj Kishore Mallik
Jharsuguda

Saroj Kant Prasad
Jharsuguda

Mohanakrishnan K
Noida

Sunil Prasad Rath
Jharsuguda

Ajay Kumar Mallick
Jharsuguda

Jitendra P Chauhan
Bathinda

Vinod Kumar
Jharsuguda

Mohammad Salim
Jharsuguda

Bibhuti B Pal
Jharsuguda

Employees with 10 years of service

Jatinder Singh
Bathinda

Brijraj Sen
Jharsuguda

Neelendra V Singh
Kashipur

Brijesh Kumar
Bathinda

Biswa B Pani
Jharsuguda

Om Singh
Kashipur

Raja Badsha De
Noida

Chaturbhuja Sahoo
Dahej

Ranjan Kumar Sethi
Jharsuguda

K. Sudhakaran
Bathinda

Balram Singh
Bathinda

Baljinder Singh
Bathinda

Niladri Banerjee
Jharsuguda

Bhaskar C Sahu
Jharsuguda

Krishan Gopal S
Bathinda

Siddhartha Nath
Bathinda

Employees with 10 years of service

Yogesh Prajapati
Hazira

K. S. K. Raju
Noida

Ashutosh Ranjan
Noida

Harsh Patel
Hazira

Dipak A Vegad
Hazira

Mandeep Sharma
Bathinda

Sanjay Tailor
Hazira

Ankit Kochhar
Bathinda

Prashant Waghmare
Bathinda

Kalpesh H. Prajapati
Hazira

Madhusourav Mohapatra
Jharsuguda

Sakti Samantaray
Jharsuguda

Visakh. P. Vinod
Noida

Neeraj Upadhyaya
Noida

Amal Naudiyal
Noida

Kush Kant Singh
Noida

Employees with 10 years of service

Praveen C Jha
Kashipur

Ashish Kathuria
Kashipur

Devinder S Rawat
Jharsuguda

Gurvinder Singh
Bathinda

P Rajesh Naidu
Bathinda

K Rao Chandaka
Bathinda

Honey Gautam
Noida

Mohrab Ansari
Jharsuguda

Digvijay Parija
Jharsuguda

Alanka P Panda
Jharsuguda

Arvind Pandey
Jharsuguda

M Umar Ansari
Jharsuguda

Bipin BChaubey
Jharsuguda

Kishor Ram Mundel
Jharsuguda

Manoj Kumar V
Jharsuguda

Lakshmana Rao K
Noida

Employees with 10 years of service

Nisha Banswal
Noida

Rajan Dasan
Visakhapatnam

Sameer Khan
Visakhapatnam

Gouthu N Rao
Visakhapatnam

Dhurbajyoti Ghosh
Visakhapatnam

Md. Rakib Ansari
Visakhapatnam

Purusottam Sahu
Visakhapatnam

Shiv Shankar
Visakhapatnam

Karri Venkata Rao
Visakhapatnam

Karri Ramprasad
Visakhapatnam

Amarjeet Yadav
Visakhapatnam

Ratikanta Pradhan
Visakhapatnam

Janam D Rao
Visakhapatnam

Suresh K Adari
Visakhapatnam

Nagarjuna Surada
Visakhapatnam

Eepi Srinivasa Rao
Visakhapatnam

Employees with 10 years of service

Y B Appala Raju
Visakhapatnam

Chodipalli Korlayya
Visakhapatnam

Bharghav H G
Hazira

Nagendra Singh
Visakhapatnam

Gursewak Singh
Bathinda

Kondala Rao Karri
Visakhapatnam

T. Srinivasulu
Visakhapatnam

Appala Raju P
Visakhapatnam

Durga Prasad S
Visakhapatnam

Sonu Kumar
Barauni

Employees with 05 years of service

Sl. No	Name	Location
1	Ajit Kumar	Barauni
2	Mohan Rao Reddi	Barauni
3	Ravichand Shah	Barauni
4	Sujit Kumar	Barauni
5	Ajay Yadav	Bathinda
6	Ajeta Singh	Bathinda
7	Amanpreet Singh	Bathinda
8	Amit Mohan Srivastava	Bathinda
9	Dharmendra kumar	Bathinda
10	Gurdas Singh Makhan	Bathinda
11	Gurvinder Singh	Bathinda
12	Hiren Jagatiya	Bathinda
13	Niranjan Sahu	Bathinda
14	Pawan Vikas Devgan	Bathinda
15	Rajinder Singh	Bathinda
16	Sandeep Singh	Bathinda
17	Sujit Kumar Padhi	Dahej
18	Abhinav Srivastava	Harduaganj
19	Koppisetti Vinod Kumar	Harduaganj
20	Diwan Singh	Hazira
21	Mehul R Satasiya	Hazira
22	Ajay Shankar Rai	Jharsuguda

Employees with 05 years of service

Sl. No	Name	Location
23	Akash Kumar Naik	Jharsuguda
24	Aman Kumar	Jharsuguda
25	Amit Dwivedi	Jharsuguda
26	Amit Jangra	Jharsuguda
27	Ashish Kumar Gupta	Jharsuguda
28	Balvinder Kumar	Jharsuguda
29	Bharat Chauhan	Jharsuguda
30	Bibhakar Jha	Jharsuguda
31	Chaman Prakash Verma	Jharsuguda
32	Deepak Kumar Yadav	Jharsuguda
33	Dharmendra kumar Gupta	Jharsuguda
34	Dharmendra Kumar Pandey	Jharsuguda
35	Dheeraj Jha	Jharsuguda
36	Dhiraj Kumar Singh	Jharsuguda
37	Khemraj Saratkar	Jharsuguda
38	Manoj Sabar	Jharsuguda
39	Naval Kishore Choudhary	Jharsuguda
40	Navneet Sharma	Jharsuguda
41	Neelesh Pathak	Jharsuguda
42	Nitin Kumar Mishra	Jharsuguda
43	Pradip Kumar Yadav	Jharsuguda
44	Prasanta Kumar Lenka	Jharsuguda
45	Prem Chand Kumar	Jharsuguda
46	Rama Mohan Mopidevi	Jharsuguda
47	Ranjit Swain	Jharsuguda

Employees with 05 years of service

Sl. No	Name	Location
48	Ravi Kumar Shaw	Jharsuguda
49	Rupesh Kumar Yadav	Jharsuguda
50	Rupesh Satav	Jharsuguda
51	Sanjay Garai	Jharsuguda
52	Sanjay Yadav	Jharsuguda
53	Sanjiv Kumar Jha	Jharsuguda
54	Satya Prakash	Jharsuguda
55	Satyajit Baral	Jharsuguda
56	Satyaranjan Swain	Jharsuguda
57	Shantanu Ghosh	Jharsuguda
58	Sidhartha Roy	Jharsuguda
59	Sunil Koley	Jharsuguda
60	Surendra Kumar Mishra	Jharsuguda
61	Surya Komal Ajmera	Jharsuguda
62	Swarnim Khamparia	Jharsuguda
63	Tapan Kumar Roul	Jharsuguda
64	Utkarsh kumar Singh	Jharsuguda
65	Vikas Narang	Jharsuguda
66	Yogesh Motiramani	Jharsuguda
67	Monusingh Jaswantsingh Weggad	Kashipur
68	Mukesh Kumar	Kashipur
69	Om Prakash Vishwakarma	Kashipur
70	Ranjan Sharma	Meja
71	Anil Kumar Ghosh	Noida
72	Divya Sachdeva	Noida

Employees with 05 years of service

Sl. No	Name	Location
73	Jayant Kumar Mohanty	Noida
74	Manindra Kumar	Noida
75	Rajiv Chowdhary	Noida
76	Ratikanta Panda	Noida
77	Sanjay Kumar Kashyap	Noida
78	Satish Kumar Saripalli	Noida
79	Vinkal Sharma	Noida - On Bench
80	Vivek Kumar Mehta	Noida - On Bench
81	Kashibhatla Venkat Kashi Vishveshwar	Padmapur
82	G Srinivasa Rao	Visakhapatnam
83	Shyam Prasad Gujjula	Visakhapatnam
84	Sk Nur Mahammad	Visakhapatnam

Newsletter Design
Subeesh Balakrishnan

Editorial Team
Samir Sachdeva, Vedika Agrawal

XXII Foundation Day
Annual Newsletter - 2023
STEAG Energy Services (India) Pvt. Ltd.
www.steag.in

Corporate Office
A – 29, Sector – 16
Noida – 201 301
India
Phone- +91 120 4625 - 000
Fax +91 120 4625 -100

Registered Office
507, Bhikaji Cama Bhawan
Bhikaji Cama Place
New Delhi – 110 066
India
CIN: U31101DL2001PTC188324

steag
energy services