INFRASTRUCTURE CLUSTER

41%

Growth in
New Orders

63%

Contribution to
Business Acquisition

51%

Contribution
to Revenue

Infrastructure
Business Review

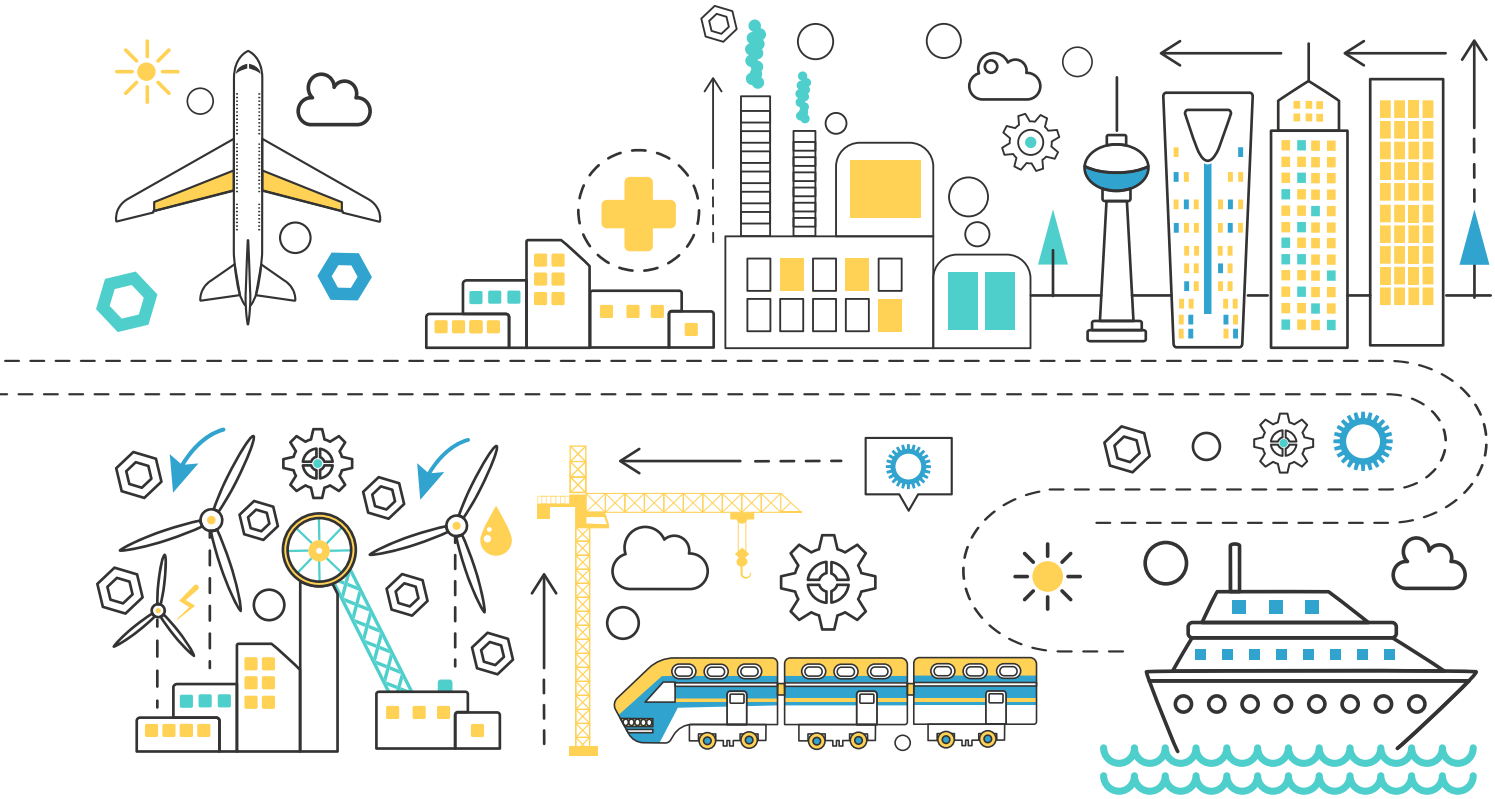
- Urban Development Urban Development
- Water and Wastewater
- Environment
- Urban Transport
- Ports & Harbours
- Industrial Facilities
- Buildings

Project Management
Business Review

- Engineering Review
- Construction Management/Supervision
- Program Management
- Interface Management
- Specialised Services
- Quality & Safety Audits
- Outage Management

EcoFirst
Review

- Sustainable Integrated Design of Buildings
- Urban Design
- Sustainable Engineeronomics
- Climate and Sustainability Services
- Program Management
- Digital & Modelling



INFRASTRUCTURE BUSINESS REVIEW

The Infrastructure Business Unit of Tata Consulting Engineers impacts the everyday lives of ordinary people and is continuously striving to improve their quality of life. To achieve this, we work closely with public and private sector players in the Infrastructure space, including Government and local authorities and international funding institutions. We plan and design sustainable townships and cities, waterways and water distribution and transportation. We have successfully managed complex engineering projects across the spectrum, securing a high degree of excellence in building large-scale infrastructure.

30000 MLD
Water & Wastewater Treatment Plants

22.5 Million Sq. Ft
of Logistics Parks & Warehouses

30000 MLD
Desalination Plants

13.36 Million Sq. Ft
Training Institutes

44 KM
Underground Tunnel for Water Conveyance

1620
Bed Hospital Facility

1 DDC
For Agra Metro

1
Container Terminal Project in Bangladesh

AREAS OF EXPERTISE

Water and Environment:

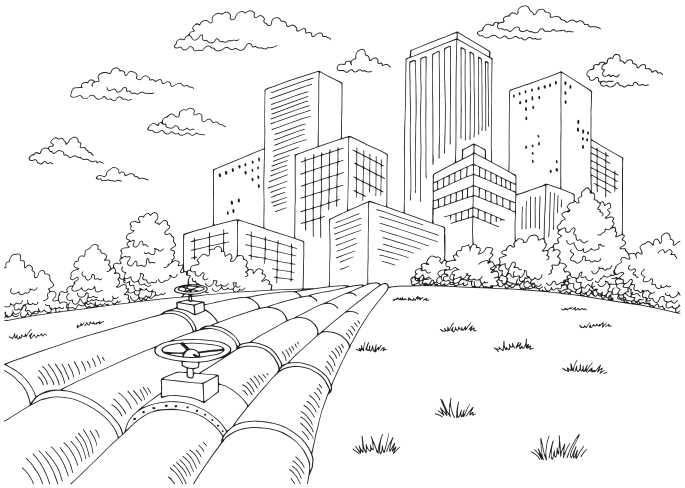
- Engineering solutions in water, wastewater management, desalination, stormwater drainage, irrigation projects, and partnering with water conservation and leakage management authorities.
- Solid waste management, Waste to Energy Projects, EIA, EMP
- Underground tunnels for water supply and wastewater conveyance.
- Improvement of Water Distribution for reducing Non-Revenue Water
- Water & Energy Audit
- Managing and improvising environment ventures such as heritage conservation, rainwater harvesting, pollution control, biodiversity conservation.

Built Environment:

- Building a city with complete infrastructure planning, design and commissioning offerings
- Providing engineering solution for large capacity industrial units and manufacturing facilities
- Leveraging 3D platform for Engineering Model of complex buildings
- Developing nationwide institutional infrastructure
- Infrastructure development for Projects of National importance
- Green Buildings solutions

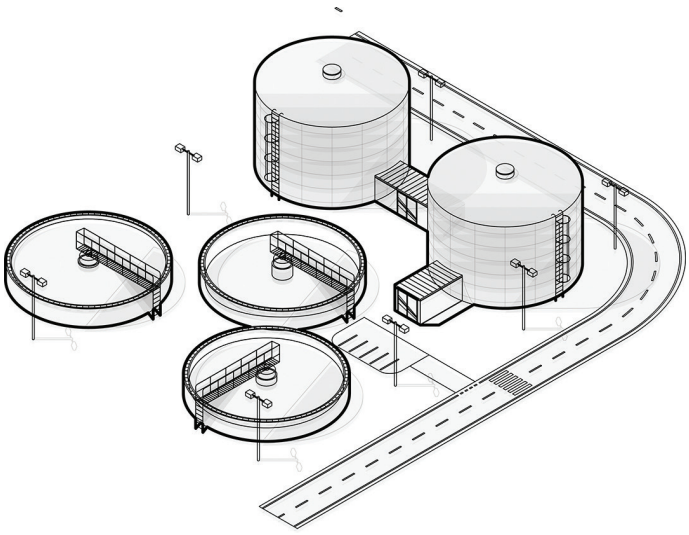
Transportation:

- Designing standalone urban transport infrastructure including airports, rail systems and ports.
- Development and commissioning support in connecting tech cities and large SEZ spaces.



KEY TRENDS SHAPING THE INDUSTRY:

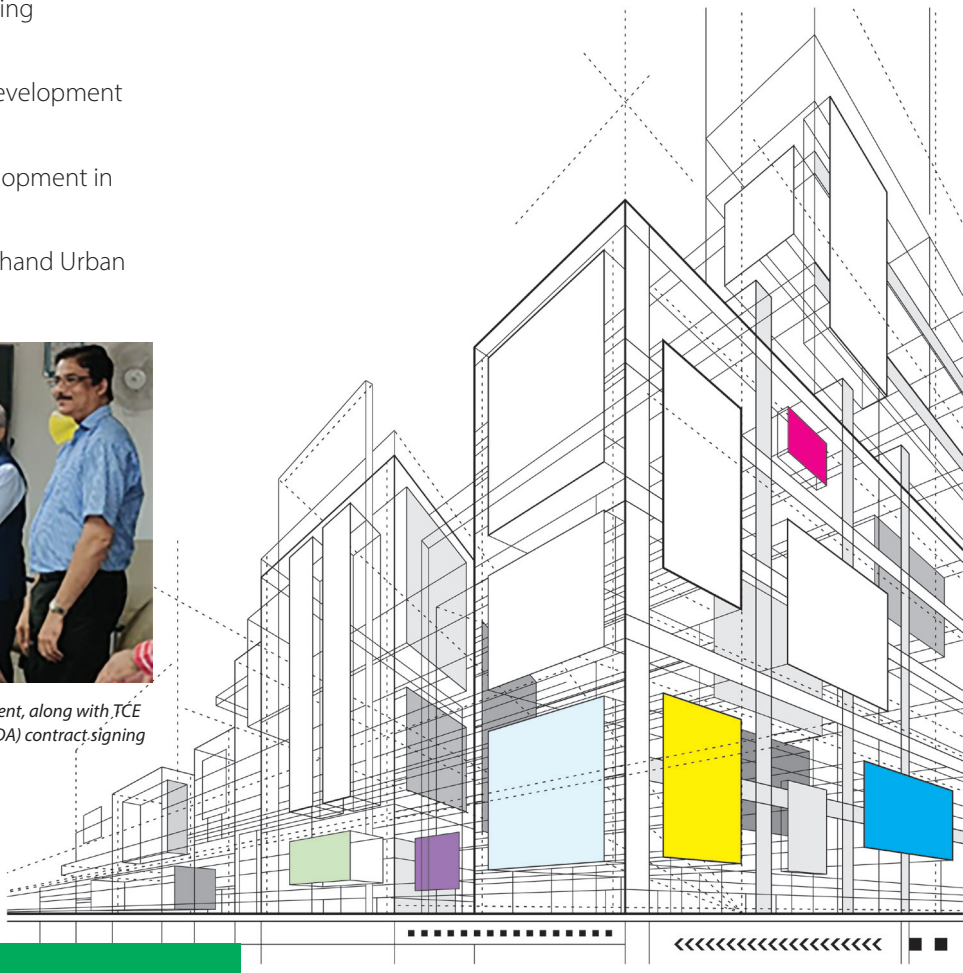
- An ever-increasing focus from the Government on the need for nationwide infrastructure and National Infrastructure Pipeline (NIP) has been formulated for different industry domains.
- With an upward trend in urbanisation and the need for sustainable infrastructure, many medium to large-sized greenfield townships/affordable housing schemes are planned in many Tier-II and Tier-III cities and up-gradation of existing infrastructure in Metro cities.
- The introduction of 'Make in India' and 'Production Linked Incentive (PLI)' schemes will push new industries and Logistic Parks to set up pan India. TCE will leverage its innovation excellence and project expertise to establish enduring relationships to stay relevant amid a rapidly changing world.
- Expand its presence in metro rail services, ports, river interlinkages and transportation; and look for assignments in Data Centres and assignments of Ministry of Defence.
- Exploration of partnerships or collaborations for high-speed rail networks.
- As the population grows with urbanisation and industrialisation, more efficient transportation services are in high demand, mainly mass commuting services Intra & Intercity.
- Due to extreme weather conditions and high water stress levels, there is a growing demand around identifying alternate water sources and efficient distribution of good quality water in towns and cities. The role of private players in the water industry is expanding, panning out a wide range of opportunities for smart water management, alternative water sources - desalinisation and water reuse/ recycling.
- The company is also keenly exploring establishing a sizable footprint in Defence and Data Centres



KEY ACHIEVEMENTS:

- Amongst the top three Infrastructure Consulting companies in India.
- Associated with prestigious Central Vista Redevelopment Project in New Delhi
- Bagged PgMC project for Infrastructure Development in Odisha
- Bagged PMC services for ADB funded Uttarakhand Urban State Development Agency.

Manmohan Soman, Infrastructure Business Unit Head and Vice President, along with TCE Water team for Uttarakhand Urban Sector Development Agency (UUSDA) contract signing with Mr Vinay Mishra Program Director (UUSDA)



A PROJECT

Transformation of Central Vista

A yet another pride of nation project, the Central Vista aims to build an icon of governance in India with modern, sustainable, efficient & effective facilities.

TCE is providing Consulting Services for Structural Engineering & External Infrastructure services to CPW. Our Scope includes providing Engineering Consultancy Services for Infrastructure Master Plan & Detailed Engineering of External Infrastructure with Sustainable solutions comprising of Planning and Mechanical, Plumbing and Fire Fighting solutions for the buildings, IBMS, Security & Surveillance and integrated IT services for the Project

The Contractor is on board, and work is underway for the new Parliament Building and Central Vista Avenue. Tenders are due to be floated for the Central Secretariat.

New Parliament Building

Central Vista Avenue

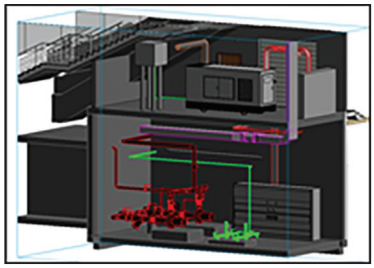
Central Secretariat

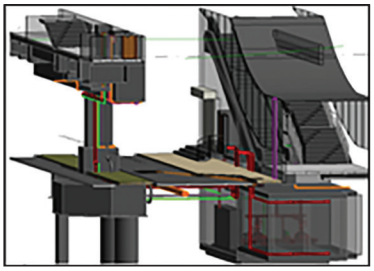
A PROJECT

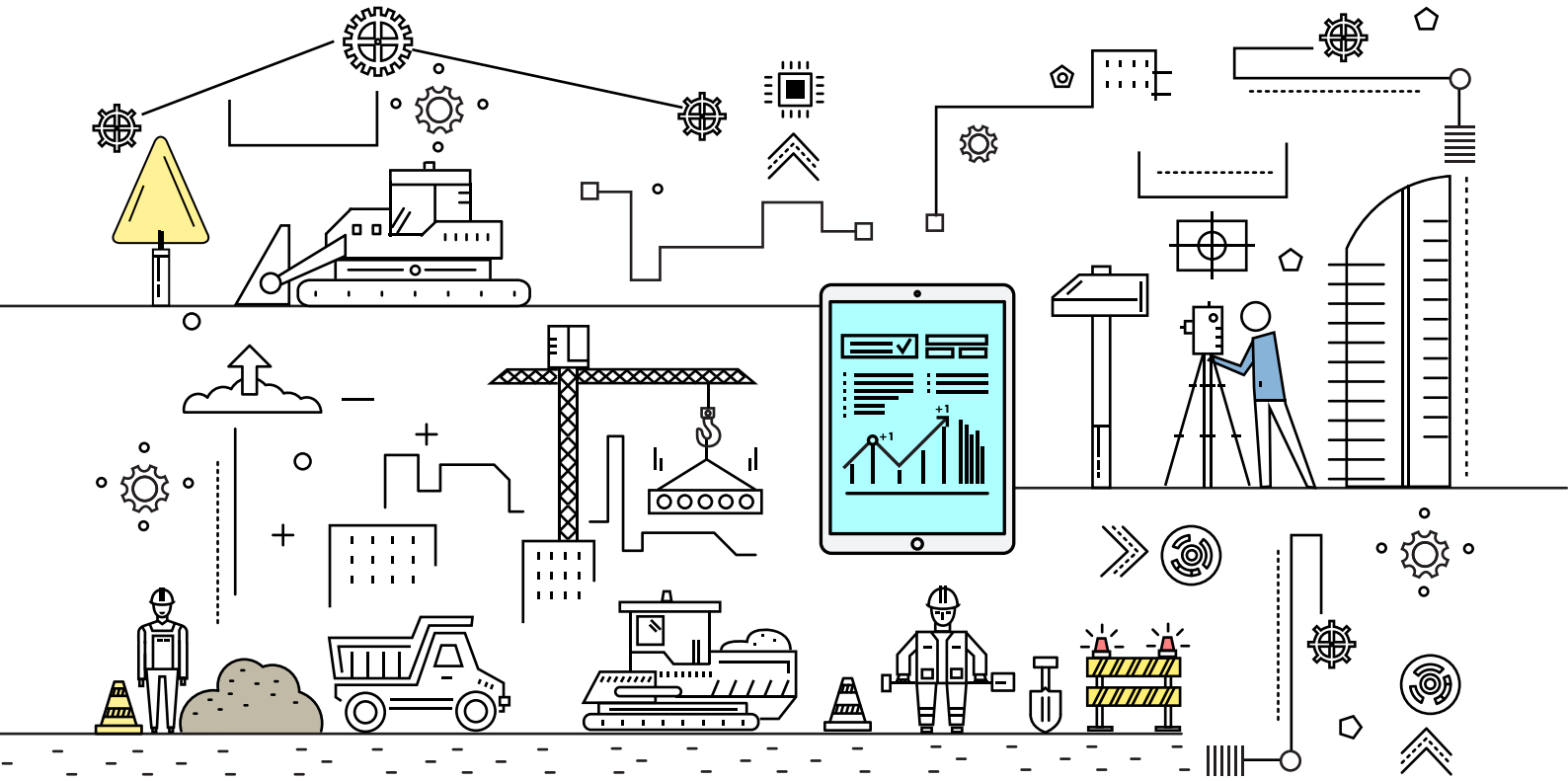
AGRA METRO Detail Design Consultancy

Tata Consulting Engineers and consortium partners have bagged the Detailed Design Consultancy for Agra Metro Works under Uttar Pradesh Metro Corporation Limited. The team has completed Concept Planning, Tendering Activities, Detail design works on BIM – LOD 350+ platform for Architecture, Civil, Building Services, VAC, ECS, TVS, BMS, SCADA, Traction Services for Elevated Stations (3 Nos), Underground stations (7 Nos), Depot (1 No) and Traction - RSS (2 Nos). The tender for Under Ground (UG) station, tunnel and traction work is ready for floating. The 48 month long projects' Scope consists of:

- Elevated Stations: 6 Nos
- Under Ground Stations: 7 Nos
- Depot: 1 No
- RSS: 2 Nos
- Viaduct: 6.569 km
- Tunnel/ Ramp: 7.681 km
- Traction: 750 V DC – Third Rail







PROJECT MANAGEMENT BUSINESS REVIEW

Every project has its own set of challenges, whether relating to budgets, logistics, timing, materials or people. At Tata Consulting Engineers (TCE), we provide a dedicated and bespoke Project Management Service as we believe every project is unique. Our knowledge-based approach ensures we understand your exact requirements and translate those into tangible solutions resulting in delivering the project efficiently and cost-effectively.

As experts in delivering complete projects, we ensure the project is managed seamlessly from initial concept to commissioning through Stakeholder Management, Procurement, Design, and Construction. We understand that projects have the best outcomes when managed smartly from start to finish, so we put the technology to best use. Our Tata value system helps ensure high Ethical practices and International standards in safety and quality.

505 Cr
Record order booking with 10 New Logos

186 Cr
Revenue (~31% higher than expected)

212 Cr
Record billing to the customer in a single year

237 Cr
Record collection in a single year

>90%
Effort Utilisation

Our Project Management team comprises highly experienced and solutions-driven project managers who have first-hand technical expertise in large scale multi-disciplinary projects across Power, Infrastructure and Resources. The offerings span EPCM services, Project Management, Commissioning Support, Engineering Programme Management and Planning, Quality, Inspection and Expediting. We have expertise ranging from Architectural Engineering, Basic Engineering, Detailed Engineering, Project Management and Construction Management.

Over time, the construction industry has overcome various challenges, but the impact seen from COVID-19 was unprecedented. Construction being a significant stakeholder and mass employer, was a victim of this pandemic. The effect was severe due to the global nature of projects involving complexities, mainly on the supply chain and workforce front. While almost everyone saw this as a threat to the "normal", the team at TCE saw this as an opportunity to reimagine "Safety". The team took charge of the sites and circulated a well thought Visual Standard Operating Procedure (SOP) to restart Site operations after Lockdown. With close monitoring of the number of cases, timely tracking and isolation of suspected patients, the TCE team facilitated site operations to return to normal, thus adding value to all our stakeholders through providing technically excellent and innovative solutions.

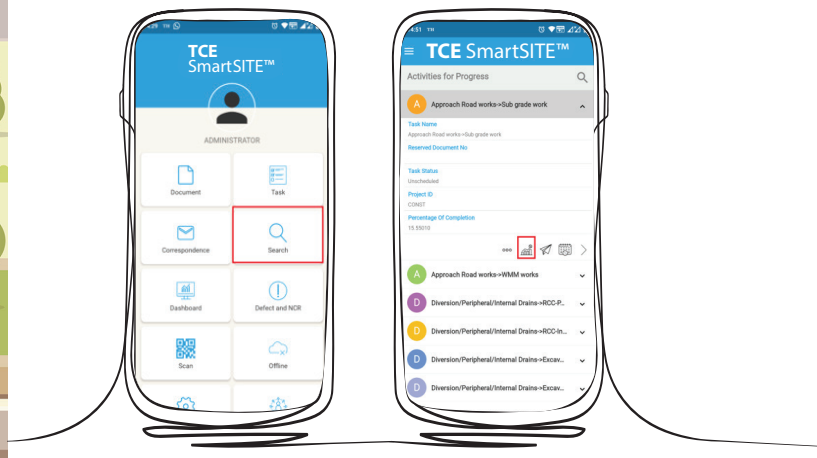
The SOP included topics critical for safe working on sites like Safety Induction, Responsibilities of Stakeholders, Restricted access, Disinfection of the premises, Monitoring and Control.

The construction industry is infamous for having very low productivity and majorly depended on the efficiency of the manual workforce, especially in India. This is mainly due to their slow adoption of systems & processes, lack of standardisation and technology innovations. With the ever-increasing complexity of projects, construction players can either adopt new technologies to improve productivity or continue to suffer losses.

TCE has been consistently adapting to the dynamic industry demands using State of the Art Technologies like BIM adoption, IIOT, Mobile Project Dashboards and Aerial Monitoring through UAVs. Taking a quantum leap towards Digitalisation, TCE added a new offering to its basket, the 'TCE SmartSite™' App accessible on Mobiles.

TCE SmartSite™ App supports Digital Collaboration and Mobility, identified as one of the key trends to help construction players in their Digital Transformation. The app is the unison of 60 years of experience in TCE and agility brought by real-time information sharing. The app users have easy access to all the standard processes, checklists and way of working developed by TCE with the experience gained while working across various sectors and geographies, right on their mobile phone.

The accessibility to past data on the SmartSite™ App helps in analysis and data-driven decision making. The inputs like activity progress, project risks, quality, safety issues and snags are summarised in dashboards used to monitor key metrics like open/close status of issues, planned v/s actual completion of milestones, look-ahead plans, mitigation plans, etc. to depict the project health accurately.



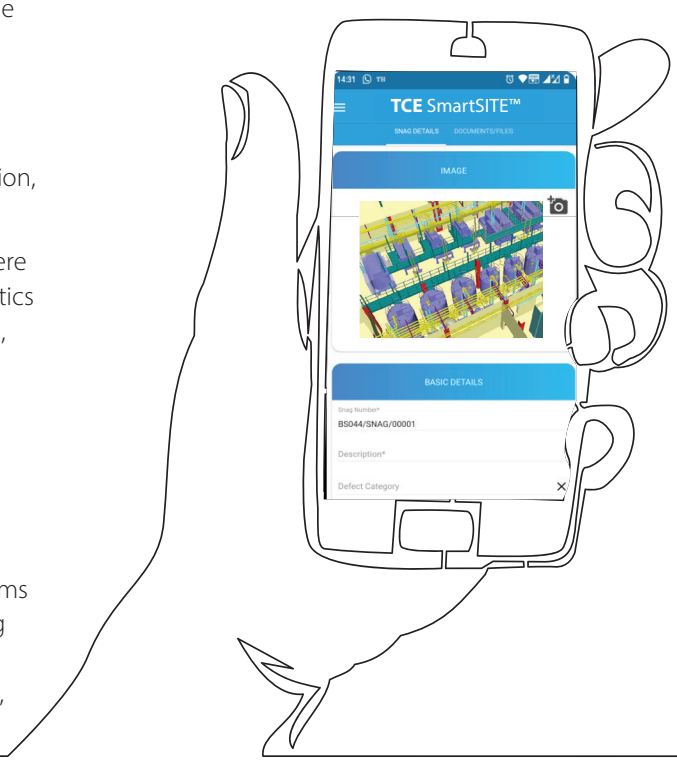
The app helps in:

- Quick onboarding supported with assigning and monitoring of roles & responsibilities
- Paperless way of working - A sustainability initiative with an added benefit of avoiding multiple touchpoints in the current COVID-19 scenario
- Cloud-based data storage, accessible from mobiles and desktops
- Enables collaboration across Stakeholders (documentation, communication and tracking)

During the unprecedented times of COVID-19 lockdown, there were significant setbacks in the market due to issues in logistics of men and material, supplemented with low fluidity of cash, leading to reduced expenditures across the globe.

However, PMC BU was determined not to slack the pace at which it has been growing and decided to take a structured approach to counter the issues at hand. The structured approach focused on the sustenance of both Order Booking and Profits by remaining agile and proactively ready for the market scenarios. The BU focused on exploring new paradigms and offerings over and above existing offerings while staying cost-competitive, attracting customer mindshare towards enhanced revenue measures, optimising resource utilisation, working on role ratios, improving revenue realisation, and focusing on Cash flow by enhancing our ability to collect.

As fruition to our collective and determined efforts, the BU achieved record numbers on all fronts.



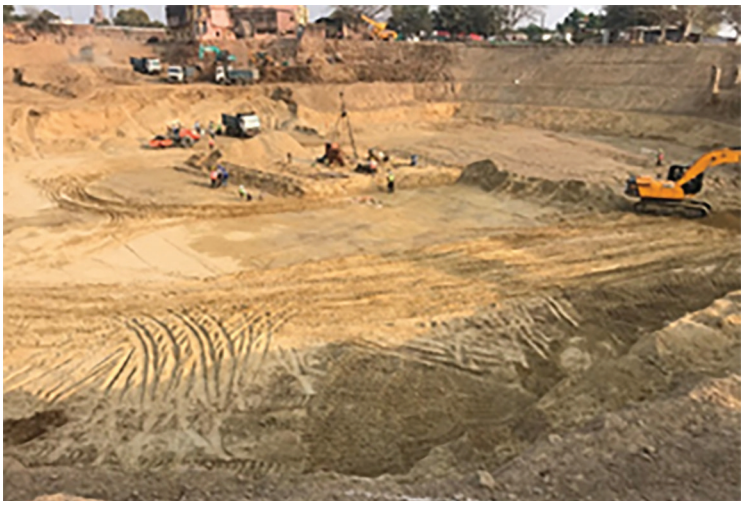
A PROJECT

Shri Ramjanmabhoomi Project

The Ram Janmabhoomi Teerth Kshetra Trust has been entrusted with constructing Shree Ram Janmabhoomi Teerth Kshetra Temple at Ayodhya, Uttar Pradesh. Tata Consulting Engineers (TCE) is the Project Management Consultant. The proposed temple area is situated on the banks of River Sarayu (Approximately 1km from the riverbank).

The main temple consists of Garbhagriha, and the temple elevated platform consists of Gudhmandap, Rang Mandap, Nrutya Mandap, Pradakshina, and Chowky. The temple is designed by a specialist Architect Consultant, as a Traditional structure, in a Nagara style of temple architecture. The Parkota around the boundary of the temple will have temples of other Gods and Goddesses. The Temple structure shall be integrated with the Ram Janmabhoomi Complex Master plan.

The temple structure will be constructed using a traditional stone structure made up of sandstone. The structural elements are joined together by tongue and groove joints. Its dimensions are approx. 380x250 feet. The main dome over Garbhagriha is 161 feet high.



Artefacts found 9-10 m below the current ground level, likely to be more than 1000 years old.

Impact of COVID-19 on Construction

COVID-19 pandemic has impacted commercial activities and industries worldwide and includes the construction industry, representing 13 per cent of global GDP. The pandemic resulted in an execution slowdown in construction projects and created workforce-related issues, especially the shortage of migrant workers forced by the situation to return to their native countries and towns.

Firms in the construction industry were faced with a plethora of financial problems, including, but not limited to, liquidity crisis, pressure on cash flows and profitability, debt servicing challenges, etc. Many companies faced legal issues and found it extremely difficult to deliver as per contractual commitments.

As a PMC, we faced our own set of problems such as lower revenue realisation and increased costs due to work stoppages at sites, poor progress on lumpsum jobs, revenue leakages due to restricted mobility of engineers, ensuring proper Safety standards for restarting Site operations, understanding and supporting Contractual implications of both Client and Contractor sides and suggesting measures in the best interest of the Projects, etc. All these challenges were reviewed by the cross-functional periodic meetings to ensure agile planning and implementation of appropriate action points. These cross-functional taskforces helped in the mobility of our Engineers across States and Countries (approx. an average of 45 Engineers were working in Africa and South-East Asia out of a total average of 800 Engineers), tracked workforce at Sites and ensured the implementation of COVID-19 guidelines and SOP for Health & Safety of every Stakeholder, understood Project Risks and suggested mitigation measures and catch up plans in the best interest of Projects.

Amidst all this, TCE also understood the importance and increased its thrust in accelerating adoption of digital and other innovative technologies like 5-D BIM, Rapid Digital Mapping, Digital Collaboration & Mobility, IIoT, Modular Construction, etc. and enhanced its pace to make these more relevant to ensure higher efficiency and efficacy of construction activities, decreasing dependence on physical records and increasing safety in the post-COVID-19 scenario. TCE SmartSite™ was made hygiene across all Sites, leading to more robustness and transparency in data-driven decision-making. And, we continue our aspirations to join the global leaders in ensuring adoption of Digital Mechanism for improving productivity, making Industry more data-driven, efficient tracking and intermediate planning of Projects, etc.

KEY TRENDS SHAPING THE INDUSTRY

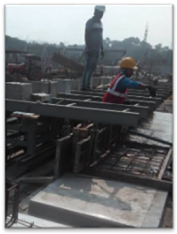
Different industries and markets are following different trends for their optimal growth, often at varying speeds. However, in a post-COVID-19 scenario, all the industries, including Construction, are finding it apt to make their businesses well-connected in a more digitised way. Hence, Digitalisation finds its place at the top in the present scenario of the Construction industry.

Following the trend, PMCBU has pledged itself towards digital workflows ranging from the adoption of SmartSite™ to drone-powered scanning and getting friendly with prefabricated technologies and its automation to embracing BIM. Acknowledging that the future of Construction lies in digital tools and automated workflows, the BU is putting continual efforts into training and adopting technology-enabled tools to improve efficiency, productivity, and collaboration at Construction sites.

The above shift requires the support of remote worksites through Mobile access to real-time data, real-time inspections, onsite accountability, including approval workflows and accurate measurements taken from a mobile phone camera. The post-COVID-19 scenario has mandated that teams continue to collaborate without physical access to materials, spaces, or even other teammates.

A PROJECT

Rourkela Smart City



Building on its steel foundation, natural setting and cosmopolitan character, Rourkela will be an inclusive, sustainable and self-reliant city propelling regional economic development with best-class infrastructure. There are 23 projects taken under Rourkela Smart City, including Smart Road, Citizen Friendly Parks, Football Stadium, Indoor Stadium, Auditorium, Museum, Command Control Centre, Pond Beautification, River Side Beautification, Smart Vending Zones, Smart Parking, Market Complexes etc.

CHALLENGES

All significant projects like Birsa Munda Football Stadium, Smart Road, Biju Patnaik Indoor Stadium, Rourkela One started after the lockdown period in April 2020. The projects continue their progress with all due diligence as per plan with no impact on the original completion date. The project team has adopted the latest technologies like Post Stressed Concrete, Lean Technology, Slip Form type Form work for Precast work to expedite the work progress. As the city is ancient, retrofitting all the roads is very challenging. Due to the existing utilities in the ROW and densely populated area, the project team overcame all challenges to execute as planned and ensure proper traffic management. Other challenges include Encroachments, Multi-level approvals, Rehabilitation, High traffic, Low traffic management, Multiple players on the same site, Unorganised existing services and Variable Soil Strata, which we overcame with some strategic planning and sound engineering solutions.

TECHNOLOGIES

Technologies and effective way of working were the reason. We could achieve our targets. In Birsa Munda Stadium, using Post Stressed Technology, we reduced our concrete work and de-shuttering time considerably. Also, taking benefit of Lean Processes, we reduced logistic time for material movement. We saved considerable time in precast concrete work as we used slip form shuttering at the precast yard. In continuation to above, we also took necessary care to avoid Kota finishing in sitting areas of the stadium by replacing the same with an excellent precast finish, thus saving cost and time. The project team has taken due diligence to achieve targets by adopting such equipment that was not considered earlier, like the Pile Rig machine for piling work and saved considerable time lost due to COVID-19.

A PROJECT

CIDCO-Package 4

Considering the importance of providing affordable and quality housing, CIDCO has undertaken a housing scheme in various nodes of Navi Mumbai. These projects comprising roughly 89,777 flats are being developed near railway stations & bus depots to bring down travelling distance and encourage public transport use.

Package-IV was awarded to M/s L&T Ltd. for Construction of approx. 23,432 dwelling units under the category of EWS and LIG. Tata Consulting Engineers (TCE) is the Project Management Consultant. The project is located at four sites Bamandongri, Kharkopar (E), Kharkopar (W) & Taloja Sector-39, under various plots. Principally all these housing complexes are being developed with amenities & facilities under part of the PMAY – Pradhan Mantri Awas Yojana Govt. scheme. EWS type houses are to be built with 322 sq. ft. carpet area, and LIG type houses are to be built with carpet area varying from 384 to 552 sq. ft.

Salient features:

- Building type is EWS (Economy Weaker Section) & LIG (Lower Income Group)
- Precast Technology, PT slab & Mivan Technology are being used for Construction at Kharkopar
- Engaged workforce –Labours approx. 4000 nos. & employees approx. 400 nos.
- No. of Buildings / Tenements - 187 nos. / 22,973 nos.
- Built-up area - 1,79,84,058 Sq.Ft

Key Challenges:

- The project started during the COVID-19 pandemic. The mobilisation was a critical issue.
- The restriction on workforce movement due to lockdown situation.
- The statutory clearances from Government authorities in time.
- Encroachment at project acquired land.
- Rerouting / Relocation of existing infrastructure (utilities-sewer, water & electrical).

Achievements of Projects:

- Arranging & handling the enormous task force on such a massive project during the pandemic situation. Almost 4500 people are working on this package alone.
- WRENCH (Design) & TCE SmartSite™ (PMC) management system has been implemented for effective drawings and documents flow in the project. All major stakeholders, i.e. M/s. AHC and M/s. L&T Construction adopts the system.
- BIM 4D is implemented at the site using Revit (Autodesk) / Tekla (Precast), Primavera P6 & 4D Visualization – Navisworks (Autodesk) software.
- Five million Safe person-hours achieved.

ECOFIRST BUSINESS REVIEW

(A 100% subsidiary of Tata Consulting Engineers)

At Ecofirst, we provide comprehensive and holistic Integrated Design solutions across the project lifecycle. Sustainable by Design is our supreme motto. Sustainability for us is about taking care of the environment and social concerns and meeting the financial goals of capital and operational excellence, reflecting through our design philosophy.

We specialise in creating sustainable designs and responsible development solutions by seamless integration of Architecture, Engineering & Environmental Technology. Our work in Retail, Townships, High Rise, IT Parks & Warehousing Industries ranges PAN India. We strive to provide our associations with expertise in conceiving and developing performative, operative and feasible solutions.

25%
Growth in last 5 years

60+
People Resources

250+
Projects

AREAS OF EXPERTISE

Sustainable Integrated Design of Buildings

- Master Planning
- Architecture
- Landscape Design
- Facade Design
- Structure Deigns
- Building Engineering (MEP)
- Site Engineering (Infrastructure)

Digital & Modelling

- Energy & Light Modelling
- Flood Modelling
- Vertical Transport
- Traffic Simulations
- Crowd Modelling
- BIM 3D-7D/Revit
- Digital Twin

Urban Design

- City & Street Planning
- Urban Design
- Urban Planning

Sustainable Engineeronomics

- Building Engineering (MEP)
- Land Development and Wet Infrastructure
- BIM 7D
- Flood Modelling and Stormwater Management
- Vertical Transport and Crowd Mobility
- Technical Due Diligence

Program Management

- Self – Redevelopment Programs
- Heritage Buildings
- Special Buildings
- Sports Infrastructure

Climate and Sustainability Services

- Climate Change Vulnerability Assessment
- Life Cycle Assessment
- SDG Implementation Handholding
- Design Enhancement
- Sustainability Audits
- Green Building Certification
- Sustainability Monitoring (Post Occupancy Evaluation)
- Testing & Commissioning

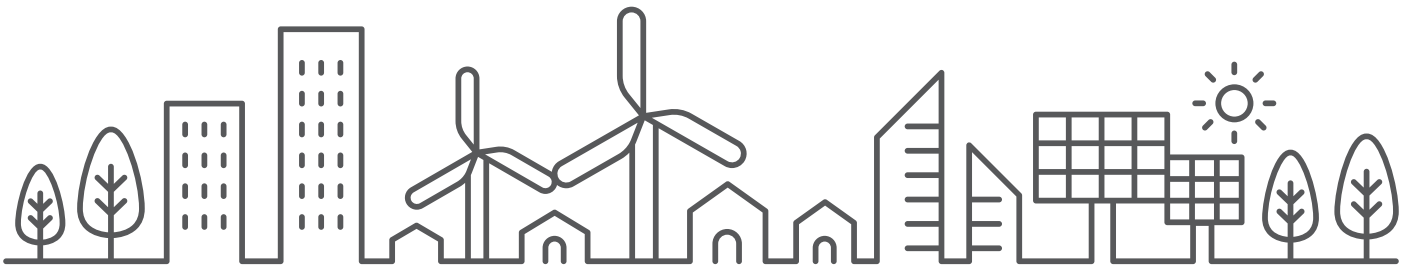
KEY TRENDS SHAPING THE INDUSTRY:

- With increasing awareness about sustainable living, increasing trends are visible for demand in sustainable designs and buildings. Both public and private players are increasingly looking for solutions to coexist with nature.
- The digital revolution is also visible with growing impetus on Digital Modelling and Building Information Modelling (BIM) requirements to intelligently manage built spaces.
- Aggressive pricing by all Consultants/Competitors.
- Reduced willingness to pay for quality/comprehensive work
- Tendency towards EPC mode
- Smaller consultants coming together to provide single point services
- Longer validity period due to uncertainty on project completion timelines

In line with the market trends, Ecofirst is gearing up to provide sustainable solutions and continuously update its portfolio with the changes in the environment. The subsidiary has proven its mettle with flawless execution and delivery of several mega projects. It has achieved Platinum & Gold certifications to establish itself as a leading player in the sustainable solutions space.

SOME HIGHLIGHTS:

- Successfully started New initiatives for:
  - Climate Change Vulnerability Assessment (Flood Modelling)
  - Redevelopment of Societies
  - Warehouse & Data Centre
- **Volume program for sustainability:** Entering into new areas or volume programs like pre-investment due diligence with funding agencies, Technical due diligence for real estate players and climate change risk assessments with volume players in warehousing, data centre or other commercial properties.
- **Sustainable Integrated Designs (SID):** Acquired new projects from real estate, strengthening the portfolio further.
- Signing **MOU with Earl Carl Wash** for a long term partnership for sustainable technology implementation support program pan India.
- Acquired and delivered assignments **for IMF** (pre-investment assessment)

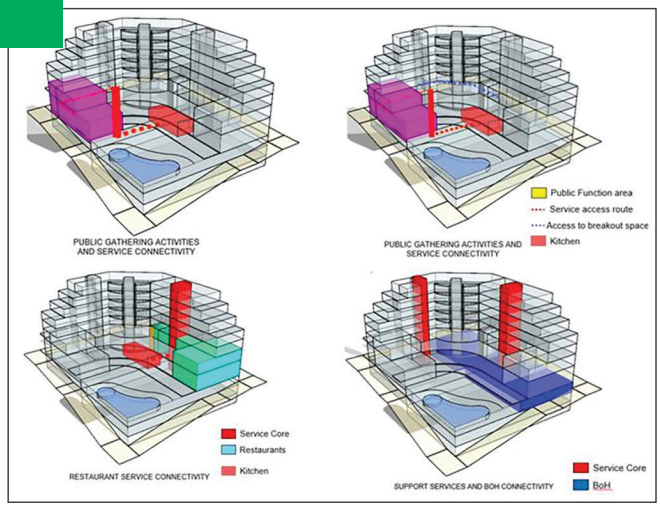


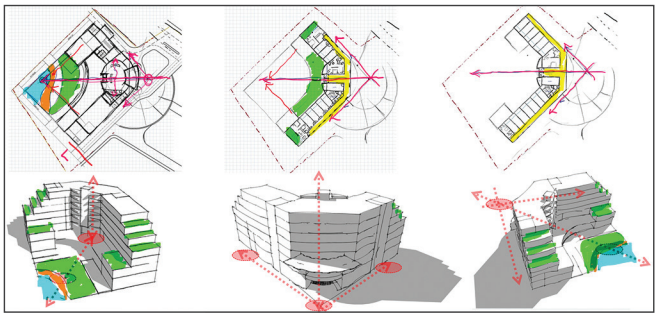
A PROJECT

Sustainable Integrated Design for Agami Township, Pen, Maharashtra

Ecofirst was appointed as the sustainability design consultant with responsibilities that included complete master planning for the 12 acres site, architectural design of all the building typologies, sustainability consultancy services for net-zero carbon development, infrastructure design, MEP design and landscape design.

The primary challenge in this project was to design the site's existing terrain consisting of sharp inclines and narrow valleys. To deal with this, road network was strategically designed to minimise the cut-fill on site and to provide unhindered views of the surroundings to each residence. The other challenge was to create a seamless divide between the resort and the homes. The site's natural terrain was utilised to create different zones within site without creating any additional physical barriers. Two major nodes regulate the movement within the site, thus ensuring better access control and security within the gated development. While the township is centered around a large green open space which directs users into different zones of the plot, the residences are interspersed with pockets of green spaces to maintain a continuous connection to nature. Strategic locations for the houses ensure that there is no obstruction in the views. Public amenities are placed across a valley that has a seasonal waterfall. The resort is placed on the top-most portion of the site and its exclusivity is maintained by regulating vehicular movement.





Value Creation

Financial Capital - A strategic Eco-conscious master-planning approach was followed, optimising the cut-fill and thus reducing on the site earthwork cost. The terraced design provides more view to surrounding serene views, thus adding value to the property in terms of saleability. At the same time, the net-zero carbon footprint development approach added to the saving the overall operational cost in the project lifetime.

Intellectual Capital: Technical tools and practices helped carry out the entire exercise during COVID-19 lockdown with minimum site visits. Use of 3D platforms to analyse site challenges and design evaluation helped in more constructive interactions with the stakeholders including client.

Human Capital: The township is designed to act as a perfect getaway for people who wish to spend quality time with their close ones yet enjoying the luxury of modern living within close proximity to nature. This project is envisaged to cater the rising need of remote working facility supported with state-of-the-art technical facilities boosting their productivity while maintaining health, hygiene and quality personal time.

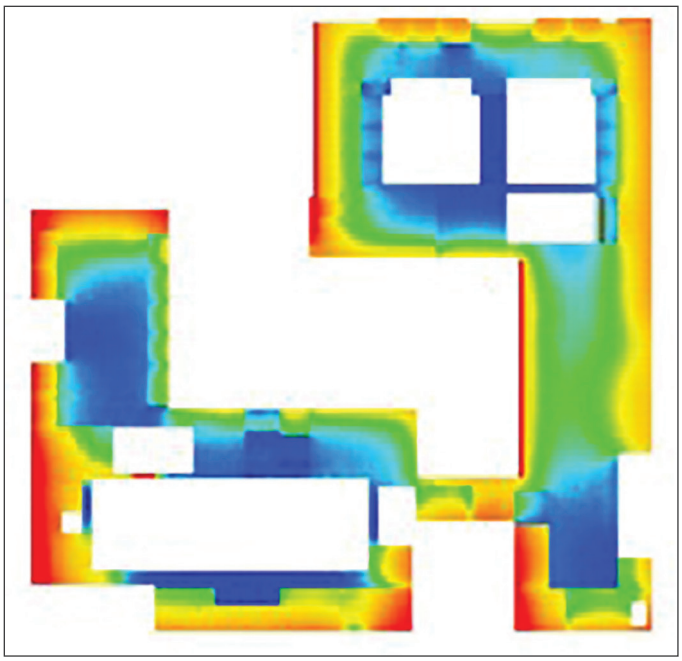
Natural Capital: From the design conceptualisation stage, the impact of nature and the environment has been a priority. Each component of the project - from design strategy to material selection, landscape and plant selection aims to reduce the adverse impact on environment and promote local materials and species to support its microclimate.

Relationship Capital: Ecofirst helped the client make informed decisions by exposing them to the potential of the development in terms of design interventions. A good relationship was established with the client by providing end-to-end solutions and technical expertise at each stage.

Social Capital: The Socio-cultural characteristics of the area has been embedded in the design. Further, this project will benefit the locals in Pen by creating new job opportunities, thus support the local economy and social upliftment. Being first of its kind in that region this project will attract investors and visitors from different places thus exposing the locality to new social and business engagement opportunities.

A PROJECT

Godrej One, Mumbai



As a part of the Green Building Certification services, Ecofirst facilitated IGBC Health and Wellbeing assessment to Godrej One, Mumbai- the headquarter building of Godrej. This is one of the first buildings of this scale/ footprint to be platinum-certified in this category.

The key role played by Ecofirst was to guide and coordinate with the facility management team of Godrej One concerning the execution of the occupant survey, on-site IEQ assessment and alignment of occupant health and wellbeing features across of project area. As it is an existing building, suggestions on Design and Infrastructural changes were limited.

IMPACT

- **Financial Capital:** Achieved reduction in energy cost due to specific temperature maintenance in the HVAC system and change in light operation schedules and daylight optimised spaces. Findings from the Indoor Environment quality assessment assisted the management team in making target specific investments. Improvements in IEQ will enhance the occupant's productivity, thereby facilitating monetary benefits for the company.
- **Intellectual Capital:** Our best technical/ quality practice helped improve the overall Indoor Environment quality and monitoring of the existing building.
- **Human Capital:** More than 80% of the operational times, the building is thermally comfortable (in terms of temperature and Relative Humidity) for the occupants. Carbon dioxide levels are monitored and are well within control. During the occupant's survey, it was observed that more than 80% of occupant were satisfied with the indoor comfort parameters. Enhanced hygiene and sanitisation facilities were made available for all occupants in work as well as leisure spaces.
- **Relationship Capital:** On-site interactions with the client, providing end-to-end solutions by exploring advanced IEQ enhancement measures, inculcating awareness concerning healthy spaces with the client has resulted in client satisfaction and long-term relationships. We have continued to receive similar work for other projects of the client.
- **Social Capital:** Encouraging healthy occupant spaces, policies and protocols in place for occupant well-being etc., has created a nourishing environment for all the staff and visitors of the office.

PLANT ENGINEERING CLUSTER

3%

Fall in New Orders

36%

Contribution to Business Acquisition

47%

Contribution to Revenue

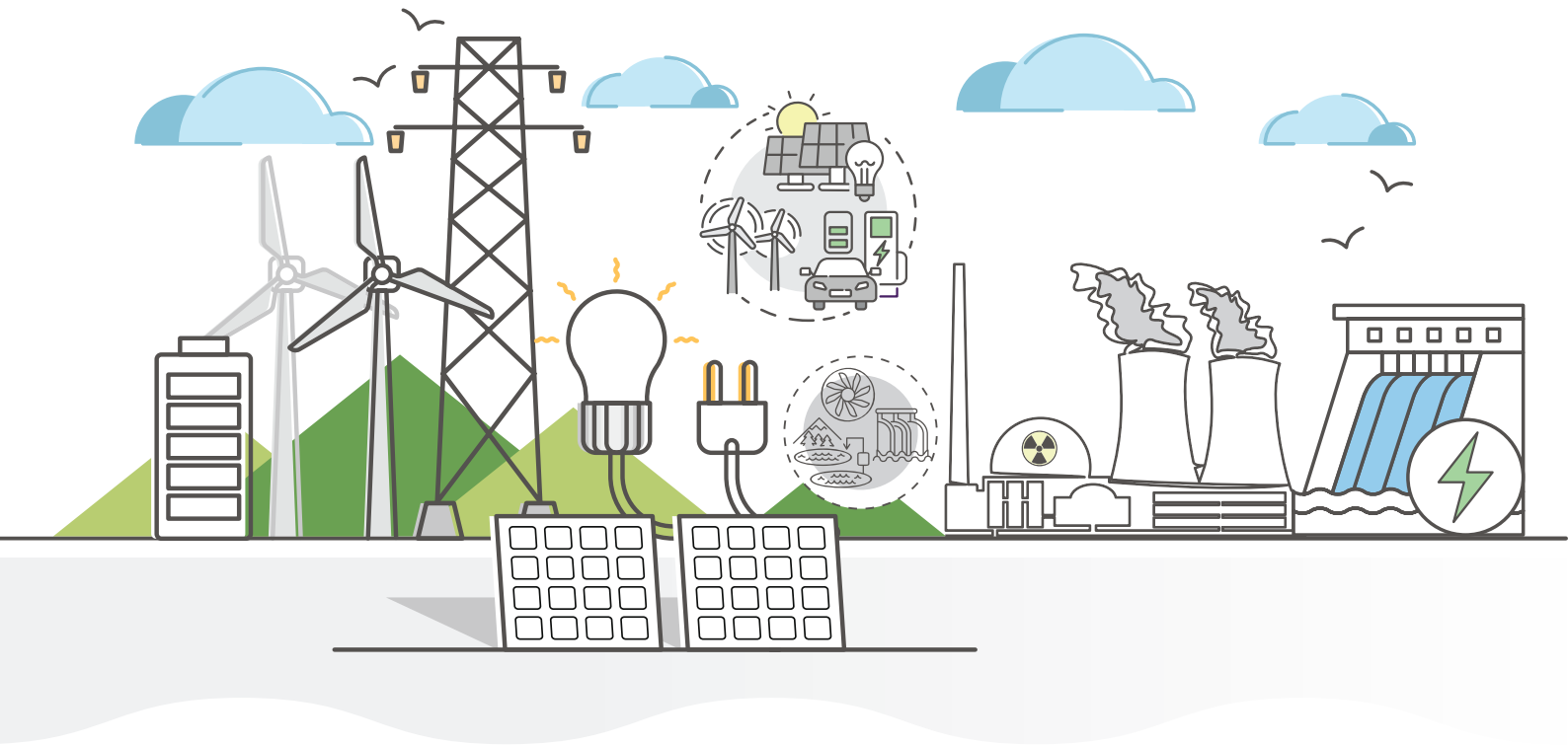
Power
Business Review

- Renewable
- Hydro
- Nuclear
- Thermal
- Transmission & Distribution

Resources
Business Review

Mining & Metallurgy
- Iron & Steel
- Mining & Beneficiation of Ferrous & Non-ferrous
- Smelting and Processing
- Geology and Mine Planning
- Mineral Processing and Beneficiation
- Material Handling.

Hydro Carbons & Chemicals
- Oil, Gas and Petroleum Refineries
- Petrochemicals
- Fertilisers
- Chemicals & Specialty Chemicals
- Food & Pharmaceuticals
- Glass, Rubber, Cement and Allied Process Industries



POWER BUSINESS REVIEW

The Power Business of TCE is amongst the top two players in the Indian market, providing value-added engineering services from concept to commissioning and life cycle management services. With decades of experience in Power Generation, Transmission and Distribution, the business is geared up to deliver emerging customer aspirations. Having made its mark in engineering and project management of various thermal power plants globally, TCE's Power Business has stayed relevant by adapting to the changing needs of energy transition towards greener and environmental-friendly power plants. The business unit offers innovative solutions to customer needs focusing on sustainability and environment.

Globally Engineered Till Date:

125 GW+
Thermal & Combined Cycle Power Plants

40 GW+
Renewable and Large Hydro Power Plants

08 GW+
Nuclear Power Plants

Energy Transition has demanded reinventing the services to ensure business sustainability. Power Business has matured capabilities in renewables - photovoltaics (PV), concentrated solar power (CSP) and onshore wind power. The same is now expanded to Offshore Windpower, Floating Solar power and Battery Energy Storage System (BESS). Variable Renewable Electricity (VRE) has mandated bundling of renewable power with other power generation sources to provide Round-The-Clock (RTC) power. Power Business has launched Sustainable Campus Solution for campuses of universities, hospitals, colonies, gated communities, R&D centress, and MSMEs to generate green power and efficiently manage water and waste water using digital technologies. This aims to convert these campuses to future ready net-zero assets. To address the needs of peak power demand and energy storage requirements, solutions using pumped-storage schemes and flexibilisation of thermal power plants for quick responses to load demand through fast ramp-up/ ramp-down are offered. In FY2020-21, a record new business of 25 Cr has been achieved in the Hydro sector through pumped storage schemes, traditional hydro generation plants, renovation, and modernisation of existing assets.

Further, digital solutions for energy efficiency improvements, system and plant performance improvements and asset life cycle management solutions are being developed and offered to thermal asset owners. Power business has developed unique Industry 4.0 based Point Solutions to cater to the large base of installed thermal power plants. Opex services offered include environmental upgrades, renovation and modernisation of existing assets. Thermal Capex orders have been on a downward trend during last 3 to 4 years and will continue to face degrowth. Hence, the Power business is working around solutions for Energy Transition by forming a cross-functional team to develop Green Hydrogen solutions for use in other industrial plants.

The power business is also set to realise the Transmission and Distribution sector's full potential and is now focused on growth. This sector has considerable investments under National Infrastructure Pipeline for grid infrastructure upgrades, HVDC, distribution and smart metering. This sector has proven abilities on challenging grid-level energy storage, renewable integration, reduction of AT&C losses, resilient grid infrastructure, electrical system studies other than routine transmission lines and substations.

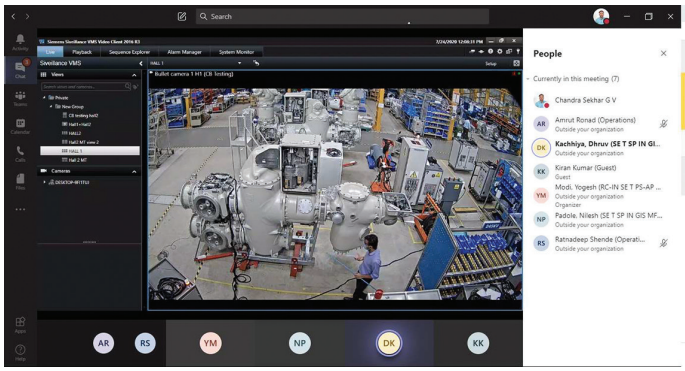
Nuclear has narrowed its gap with thermal and is set to overtake thermal as the largest sector in the power business. The domestic market continues to provide opportunities in PHWR Fleet Reactors, with Gorakhpur 1&2 2x700MW set to complete engineering activities and Kaiga 5&6 2x700MW set to begin in FY2021-22. Power business has entered into strategic partnerships with technology providers to ensure a pie out of imported Bulk Reactors set to take off in FY2021-22. A large team of 60+ engineers from TCE is stationed in France, working with ITER (International Thermonuclear Experimental Reactor), the first fusion reactor. The sector is actively scouting for opportunities in the European market, having made forays in immediate neighbourhood, Rooppur Bangladesh, other than ITER in France.

Power business has thus demonstrated the tenacity to be a sustainable business amidst energy transition. It is strategically focused on developing new technology solutions, digital and opex solutions and growth of nuclear, hydro, renewable and T&D sectors to offset thermal degrowth.

KEY ACHIEVEMENTS

- **Integrated CSP & sCO_2 based Power Plant for Department of Science and Technology, Government of India in association with Indian Institute of Science, Bengaluru**
  A first of its kind effort to prepare a Detailed Project Report for an integrated CSP (Concentrated Solar Power) & sCO_2 (Super-critical Carbon Dioxide) based power plant is in an advanced stage of completion. The report includes the basic design details, cost estimates and a road map for scaling up and indigenising the manufacture of the equipment in India under Aatma-Nirbhar initiative.

- **eFAT of 66kV GIS & 11kV Switchgear for Wipro**
  During the pandemic, conducting & witnessing Factory Acceptance Test (FAT) of electrical equipment became a significant challenge as factory visits were restricted. Any delay in equipment supply to the project site impacts the project completion schedule. TCE proposed an online FAT [eFAT] option for 66kV Breaker & 11kV Switchgear. This innovative idea was well received and appreciated by customer & vendors. Three 360° cameras were used at the manufacturer's shop to enable this digital inspection, which offered a real inspection environment and visualisation of test readings from the remote.



- **Distribution Sector**

  The Power Distribution system is a weak link due to high Aggregate Technical & Commercial (AT&C) losses, erroneous metering, imperfect revenue realisation, and inadequate infrastructure maintenance. Power Business is actively providing services like

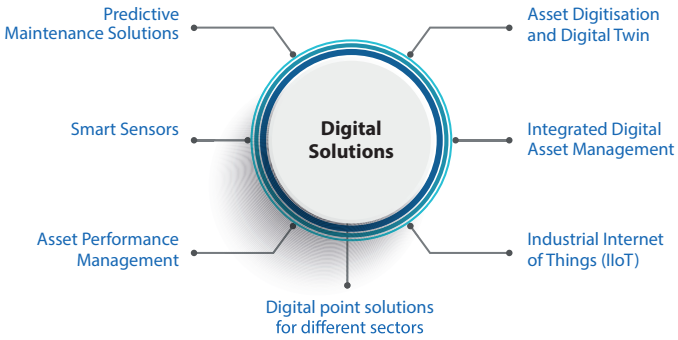
  - Power distribution network resilient to Cyclone. Work in progress for Tata Power Central Odisha Distribution Ltd.
  - Work in progress on Analysis of Transmission and Distribution Losses for Ministry of Power, Energy and Mineral Resources, Bangladesh.
  - Completed Feasibility Study of Underground power distribution networks for the urban cities of Khulna, Jessore and Barisal, Bangladesh (ADB Funded).
  - Work in progress for Project Management Consultancy Services for Smart Metering System at Yanbu, Kingdom of Saudi Arabia.

- **Digital Solutions**

  Power Business is leveraging its multi-disciplinary, multi-sector expertise to deliver advanced digital technologies and Industry 4.0 solutions across different business sectors for carrying out performance analysis, real-time detection of performance deviation, assistance to the operator with accurate root cause analysis with suggested corrective actions to enhance performance.

  TCE's Digital Point Solutions (DPoS) combine the best possible application of Artificial Intelligence (AI) / Machine Learning (ML) and domain expertise in plant engineering/ operation to provide holistic solutions for the plant operators.

  The team has developed the capability to build APR (Advanced Pattern Recognition) model, RCM (Reliability Centered Maintenance) implementation, and digital PoS and has validated these offerings in operating power plants.



KEY DIFFERENTIATORS:

- Proven mettle in the Power sector, contributing to about 170 GW+ of power generation.
- Capabilities in all forms of renewable power – ground-mounted solar, rooftop solar, floating solar to CSP projects, onshore and offshore wind, energy storage and hybrid plants, biomass and waste to energy projects.
- An established player in Micro, Mini, Small, Medium and Major Hydro Power Plants, Pumped Storage Systems, Dam Rehabilitation and Renovation and Modernisation of Hydro Power Plants.
- Market leader in Nuclear power plant engineering with more than 85% market share in India. Successful international forays with ITER and other European opportunities.
- Rich experience in Environmental upgrades, Renovation & modernisation, and Plant due diligence, including plant safety review for all types of power plants.
- 75% of revenues for the business comes from Key and Strategic Customers demonstrating focused account management aided by quality and timely delivery. Top 10 Customers account for 80% of business acquisition.

AREA OF EXPERTISE:

- **Renewable Power:** Solar – PV, CSP, floating solar; wind – onshore & offshore, biomass, hybrid, battery energy storage and waste-to-energy. Micrositing, Yield Assessments, Technology Evaluation, Detailed Project Reports, Site Data Analysis, Grid Integration.
- **Hydro Power:** Hydrological and Hydraulic Studies, Hydro-mechanical and Hydro-structural engineering, Seismic studies, Water resources, control and instrumentation.
- **Nuclear Power:** Power generation, fuel fabrication, fuel reprocessing, waste disposal.
- **Thermal Power:** Coal, gas, captive and cogeneration. Energy transition to Hydrogen and sCO2 power cycle.
- **Opex Services:** Plant renovation, modernisation, emission retrofits and performance improvement projects and various Industry 4.0 digitalisation solutions in existing facilities.
- **T&D:** Transmission lines, substation, distribution, smart metering and system studies.

KEY TRENDS SHAPING THE INDUSTRY:

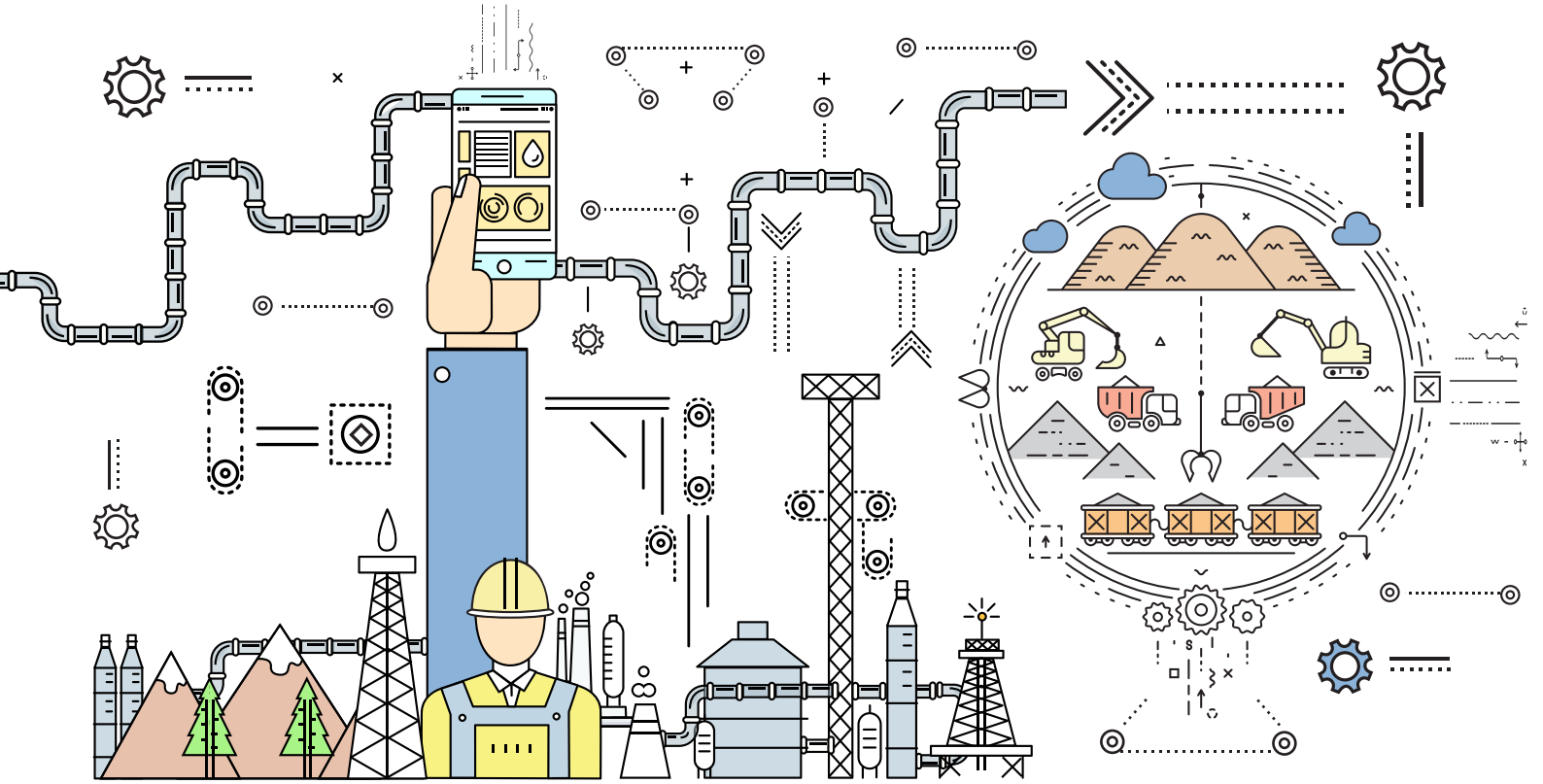
- Sustainable Development Goals are driving Energy Transition across sectors with a focus on clean and green energy. Renewable growth focus across geographies. Floating solar PV projects gaining momentum, Offshore wind power gaining traction and GW scale Solar/Wind Hybrid parks being developed in India. Interests in waste to energy and offshore wind projects are on the rise. Net Zero, Carbon-free Infrastructure, Digital, EV and Green Hydrogen Economy expected to pick pace in India in coming years.
- Flexibilisation of thermal plants, tariff-based competitive bidding for Round the Clock (RTC) power with Variable Renewable Electricity (VRE) bundled with underutilized thermal plants are being awarded. Green Term Ahead Market (GTAM) that allows renewable buyers and sellers to trade without long term PPAs is launched. This governs the market dynamics going forward.
- With ten units of 700MW PHWRs in fleet mode and imported bulk reactors opportunities, the nuclear sector is set to overtake thermal. Overseas opportunities with ITER, Korean and European majors offer international growth unexplored thus far.
- Hydro plants up to 25MW capacity are considered as renewables and are eligible for similar benefits. Pumped Storage Schemes (PSPs) receiving massive attention due to their simplicity, flexibility and quick turnaround to replace VRE.
- No new utility-scale thermal plants expected, and the focus in the sector is on digital, flexible power and environmental upgrades.
- Transmission and distribution infrastructure upgrades in India receiving due attention. Higher investments expected in transmission infrastructure, HVDC and FACTS, smart grids, distribution automation, load forecasting, microgrids, smart metering, WAMS etc. The Asia Pacific and MENA regions offer international opportunities.
- Large-scale renewable integration and adoption of mini & microgrids will impact the power flow in the grid and necessitate a new approach for grid planning studies in the future. Adoption of electric vehicles (EVs), Digitalisation and Distribution system Privatisation is also facilitating growth.
- Distribution system enhancement will bring in new players in DISCOMs and new opportunities in the areas of due diligence, AT&C loss reduction, infrastructure upgrades, energy storage, smart grids, smart meters and grid automation.
- Focus on digitalisation, IIOT and opex services for better plant operation and asset lifecycle management.

A PROJECT

Sustainable Alternatives to Karappara Kuriarkutty Irrigation Project – Kerala (SAKKIP)

Dr Rajashekhar Malur, Power Business Unit Head and Vice President, submitted the Inception Report to Honorable Minister for Water Resources, Government of Kerala, on 18th February 2021 in Palakkad

- SAKKIP is an Inter Basin Water Transfer (IBWT) project transferring water from Karappara stream of Chalakkudy basin to rain shadow regions in Palakkad district of Bharathapuzha basin
- This multi-purpose project is catering to irrigation, hydropower generation, drinking water supply and flood control. Also, it is sustainable both environmentally and socially as no sanctuary area is involved, no submergence of forest land, no rehabilitation and resettlement is required
- A Detailed Project Report (DPR) of SAKKIP covering survey, investigation, design drawings and cost estimates for the most feasible solution is complete.
- If implemented, this would be the fulfilment of a long-cherished dream of the community in the rain shadow belts in Kerala.



RESOURCES BUSINESS REVIEW

TCE's Resources sector has a proven track record of providing comprehensive engineering services from concept to commissioning, consistently delivering intelligent engineering solutions for its customers across the value chain. The Resources business has two sub-sectors, namely: Hydrocarbons & Chemicals and Mining & Metallurgy.

TCE is among the leading players in this industry segment, providing one-stop solutions for its valued customers from mines to metal manufacturing and processing. TCE's vast experience in the mining sector serves as a closed-loop solutions outfit, including Metals Processing, Ancillary Infrastructure and Raw Material Management, right from Exploration Planning.

With decades of experience in providing comprehensive engineering services (Concept to commissioning). Safety in Design and operations is critical in the Hydrogen and Chemical Industry; hence, the HCBU workforce is oriented into the Safety Instrumented System (SIS), one of the essential layers of protection against accidents and hazards of the industry.

10%
MMBU Contribution to Revenue

12%
HCBU Contribution to Revenue

HYDROCARBON AND CHEMICALS

FY2020-21 was an incredibly challenging year for companies across the globe. Plant Engineering has traditionally been collaborative; there was a belief that such work cannot work from home. However, the Pandemic forced people to think otherwise and find ways to deliver. Within a very short period of 10 days, the computer hardware was shipped to our engineers and CAD personnel. New and ingenious ways were tried and perfected for remote collaboration using MS Teams and other technological tools. Daily scheduled MS Teams meeting assigned work, discussed progress and resolved interdisciplinary coordination etc. Reviews and quality checks were conducted over MS Teams. Even 3D Model reviews were conducted online with Clients (some in different time zones/continents). The situation motivated people to devise ingenious ways to ensure continuity of delivery, ensuring efficiency and quality despite working remotely from their homes.

AREAS OF EXPERTISE

Under this sector, TCE provides comprehensive EPCM services to clients in the fields of:

- Oil, Gas and Petroleum Refineries
- Petrochemicals
- Fertilisers
- Chemicals & Specialty Chemicals
- Food & Pharmaceuticals
- Glass, Rubber, Cement and Allied Process Industries

KEY TRENDS SHAPING THE INDUSTRY

The Hydrocarbons and Chemicals sector envisages growth opportunities in the Indian markets fueled by higher consumption associated with rising living standards and rapid urbanisation in India. The growing realisation about the risk associated with the large concentration of Chemicals manufacturing in one country will present good opportunities as many large MNCs may plan to de-risk by diversifying their expansion locations.

Significant investments are planned in the refinery sector (both Public and Private Sector), Petrochemicals, and Speciality Chemicals sectors. Good demand is expected from the Construction Chemicals sector as well.

The Government of India aims to increase the share of natural gas in its energy mix from 6% to 15% by 2030. The government also plans to create a National Gas Grid, requiring the installation of additional Gas Pipeline Infrastructure

There is a thrust to utilise indigenously available Coal for manufacturing liquid fuel and Chemicals using Coal Gasification Technology. This will help in reducing the country's Crude Import bill.

India's refining capacity is planned to increase from 230 MMTPA to 440 MMTPA by 2030. All the refineries are now integrated with downstream petrochemical complexes to improve ROI and cater to the increasing demands of plastic polymers in the domestic market. Apart from the Capex projects in the domestic market, we expect to have good opportunities in the global market for the following types of projects to meet the need for sustainability and tighter emission controls:

- Plant upgrades, Automation and Revamps
- Asset Integrity Management
- Energy Optimisation Studies
- Efficiency improvement & Debottlenecking

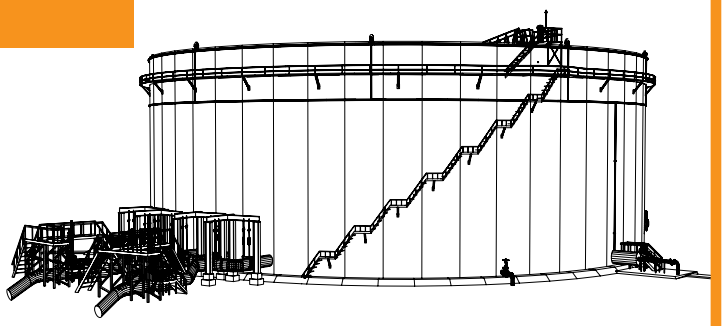
We see opportunities in bioethanol investments in India. Government of India has given a very challenging target of blending 20% Ethanol into Petrol by 2025. This will require massive addition of Ethanol manufacturing capacity. Unfortunately, the 2G Ethanol manufacturing units are not financially viable in stand-alone mode and require Viability Gap Funding from the Government of India.

The sector is well poised to leverage these opportunities with a healthy mix of domestic and international clients. This strategy is expected to help the industry maintain its growth momentum in the coming years. FY 2020-21 saw the strengthening of TCE's relationships with marquee clients, and more such long-term engagements are in the pipeline.

New and Important Projects

During FY2020-21, HCBU secured some outstanding and challenging projects on which the engineering work is progressing well despite the COVID-19 situation. Some of the noteworthy projects won during the year are:

- Greenfield Fluorochemical Manufacturing Plant for one of our strategic client in the western part of India.
- FEED Review and Project Management Consultancy Project for manufacturing Gas Processing and Methanol manufacturing plant for Brass Chemicals Nigeria
- A capacity expansion project for the manufacture of PVC for another strategic client in the southern part of India.



- Restart at the new location of WAN and TAN manufacturing project in Eastern Part of India
- Engineering Services for a countrywide program of Petroleum Fuel Retail Outlets for an Oil Marketing company.

MINING AND METALS

AREAS OF EXPERTISE

This sector continues to deliver creative solutions to customers worldwide across the value chain of:

- Iron & Steel
- Mining & Beneficiation of Ferrous & Non-ferrous
- Smelting and Processing

The focus areas in the mining sector are:

- Geology and Mine Planning
- Mineral Processing and beneficiation
- Material Handling.

Our areas of expertise are:

- Concept to Commissioning Services with interface management
- Portfolio Management Services
- Process Engineering & Interface Management
- Layout & Logistics
- Sustainability & Environmental Engineering
- Waste Management
- Asset Integrity Management

M&M BU has built its strength in Capex and Opex areas for the Iron & Steel Industry by providing services in building some of the largest plants in Iron & Steel making and Finishing areas and rebuilding the existing world in close coordination with the world reputed technology suppliers. For the last five years, the diversification has also resulted in customer orientation in providing services related to productivity improvement, operational assistance and asset integrity management throughout the life cycle of the assets. In the non-ferrous area, the sector strategy has resulted in innovative solutions to the reputed customers in the green metal entire value chain.

The experiences gained in the OPEX services has now been expanded to the non-ferrous areas to meet the present business objective. A separate dedicated team is working on identified initiatives like Energy Transition, Clean technology, High-value product differentiation, and Digital point solution to identified Industrial problems and partners.

The sector approach will be towards reskilling the entire workforce to orient in changing Industry need and the drivers enforcing the changes - Re-envisioning talent management in the digital age.

A PROJECT

Establishing viability of a Copper Smelter Project in Indonesia

TCE was inducted into the project at a critical juncture, with a brief of doing a Gap Analysis of the FEED document. For TCE, it was a first of a kind (FOAK) assignment on the captive copper smelter.

During the process, due to the high project Cost Estimate, TCE was asked to take the additional task of optimisation and value engineering to bring down the overall Project Cost. TCE studied and analysed the project and carried out trade-off studies on multiple ideas (termed 'M-15 Initiatives'). Based on these studies, the capacity of the project was changed to 900 kTPA and accordingly, the entire project was re-structured and re-engineered. TCE carried out a fresh Cost Estimation based on the M-15 Initiatives. The new Capex Figure arrived at was almost 2/3rd of the FEED estimate and made the project financial far more attractive than it was. Further fine-tuning was done to show a positive NPV for the project, which finally established viability.

SoW of TCE was further extended to include preparation of LSTK bid document, techno-commercial adjudication culminating into submission of Evaluation Report with clear Recommendation.

In re-structuring and re-engineering to downsize the plant, various other areas were also identified with the potential of cost optimisation. In this endeavour, TCE objectively analysed each of these ideas based on their technicality, cost-effectiveness and operational suitability. Trade-off studies were also carried out wherever applicable to establish the suitability of one option over the other. This part of the SoW has also been successfully concluded, and the bids received from the bidders are within ± 10% of the TCE Estimate.

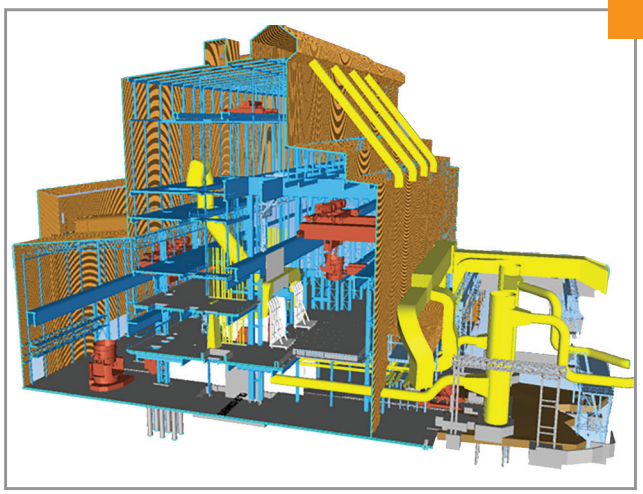
KEY TRENDS SHAPING THE INDUSTRY

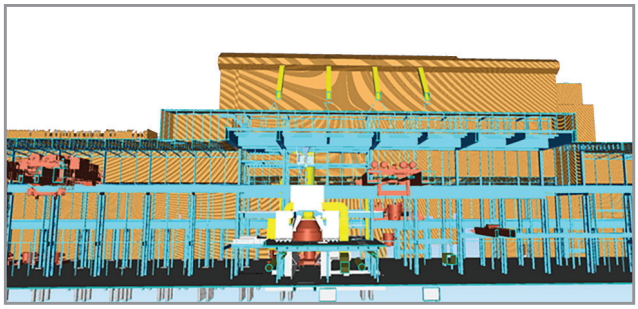
The Mining & Metals (M&M) industry is facing new challenges. In the past, the mining sector had to plan their production based on "highest volumes at the lowest production cost". Today, they have to be profitable and productive and sustainable under new & upcoming regulations. The Mining and Metals (M&M) sector is returning to growth, but companies face a transformed competitive and operating landscape.

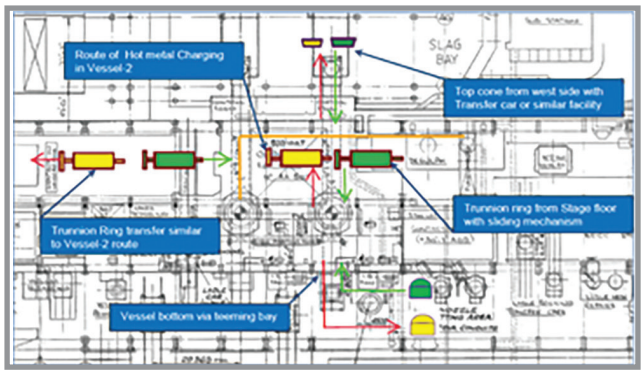
Key drivers for the next decade for this sector are the following :

- Import substitution strategy (Resource Security) with redefined globalisation
- Climate change and environmental sustainability without compromising competitiveness
- Energy transition and Net-Zero based redesign approach
- Adopting Controlled-Tower methodology in new normal conditions
- Innovate and integrate various functions to bring greater capital efficiency
- Adoption of Industry 4.0/5.0, digitalisation and remote-controlled centre for plant operations

A PROJECT
Vessel replacement in Steel Melt Shop







Among 2 - 330T capacity Converter vessel inside a Steel Melt Shop, one old Converter was planned to be replaced keeping other Converter under operation to meet the production requirement. TCE was awarded to prepare an Option Selection Report with 3 most suitable cost-effective Concept for Converter replacement work, keeping downtime for replacement work as minimum as possible, with minimum building structure alteration, maintaining all safety aspects during construction work & safety regarding ongoing production in another converter vessel.

A 3D model of the 330T capacity Converter vessel with its associated parts, Dog House structure, Duct work, Building structure, Operated Cranes inside the plant in different bays, other relevant facilities and installation at the vicinity of the converter vessel was prepared based on the 3D scan data, As-Built drawing & Drone survey to transform the asset into a digital platform, with zero site visit from engineering office. The most advanced jacking & skidding system used in construction work are being explored to facilitate removal & installation of the vessel in blowing stand through a confined corridor.

Based on a detailed study for 3 options, activities for replacing the existing vessel are being identified. Relevant structural analysis, Design and other necessary calculation are being done to estimate the quantity of modification work required. Finally, digital technical specifications for the vessel replacement work & building structure alteration shall be issued to collect fit-for-purpose offers with minimum human intervention at the site.

DIGITAL & TECHNOLOGY CLUSTER

05

Strategic Partnerships

3000+

Employees Enabled to Work from Home

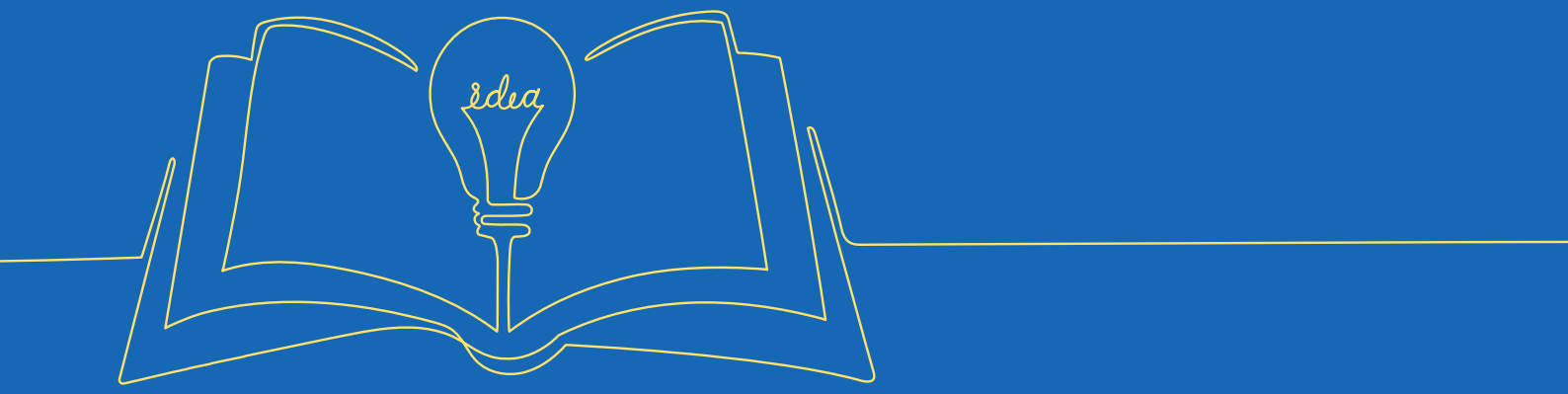
03

Critical Digital Projects Completed and Handed Over

Digital & Advanced Technology
Business Review

- Intelligent P&ID
- 3D Modeling, 4D/5D Simulation
- BIM
- Asset Digitisation
- Asset Information Management
- Digital Handover
- Engineering IT Implementation Services
- Digital Roadmap Advisory
- Asset Performance Management
- Digital Workforce Solutions
- Industry 4.0 Point Solutions
- Asset Life Assessment
- Product Engineering – Design, Analysis
- Machine Development/ Localisation
- Special Projects

Technology Group Review



DIGITAL & ADVANCED TECHNOLOGY

Digital technologies are transforming all industries, redefining business models, and creating new opportunities for proactive, innovative, and agile organisations. Organisations that enjoy a monopoly or significant market share today can no longer take comfort in their market leadership. In the traditional model of competition, the competitors are clearly identifiable. But in the digital era, the lines of competition are blurred, with erstwhile outsiders becoming real-time competitors (e.g., IT players, Management Consultants etc., in the field of engineering consultancy). These new competitors start offering unique value proposition by leveraging digital technologies and use new business models to serve customers. Business model changes will soon become one of the critical factors driving the viability of many businesses in the future.

Recognising the rapidly changing market dynamics, TCE decided to form a separate Digital Cluster to give sharper focus on growth in digital services, building innovation culture and contributing to digital transformation within the organisation. Digital Cluster plans to leverage TCEs strong domain expertise in offering differentiated digital services to customers, carve out a dominant position in the market, and support the future-proofing of TCE.

The Digital cluster comprises three groups - Digital and Advance Technology Business Unit, Technology Organisation and Corporate IT team. The Digital cluster also manages the Accelerated Delivery Centre (ADC).

While Product engineering and Asset digitisation services are established practices, Asset Management or Industry 4.0 business is under incubation. The target is to commercialise and start a business in this area this year.

Digital and Advance technology (DAT) Business Unit offers services shown in Fig-1.

DAT BU has 3 distinct offerings aligned to emerging customer needs in the plant lifecycle

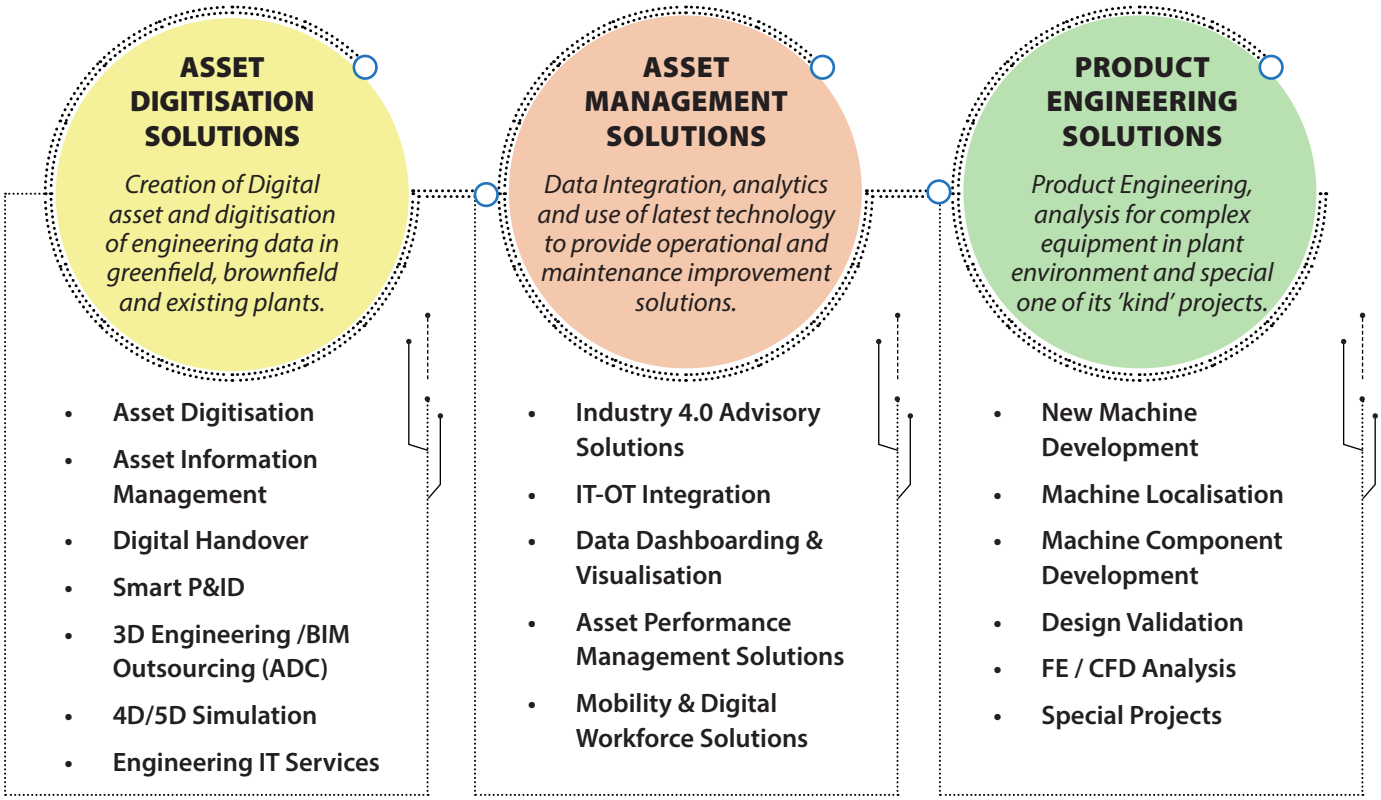


Fig-1 DAT BU Services

KEY TRENDS SHAPING THE INDUSTRY:

- **COVID-19 has led to increased awareness and opened Client mindset towards Digital Adoption:**
  COVID-19 and related business disruptions faced by most clients have led to a change in mindset towards digital adoption from 'good to have' to a 'must have'. Clients are now looking for solutions that can provide them with enhanced performance, reliability and information availability to take faster, better decisions and reduce risk—another area of high interest in 'low touch' technologies that reduce dependence on physical human presence.

- **However, the economic uncertainties are making most firms hold back on significant investments:**
  While PSUs and prominent private industrial players are floating formal RFQs of substantial value for a wide range of digital handover requirements, asset digitisation, APM, digital workforce, etc. the decision making on these tenders is witnessing much delay. Most medium-sized firms are waiting for the economic scenario to become more stable before proceeding with digital investments. The focus of many companies currently is more on investments in modernising their IT infrastructure like supply chain management, logistics, Cloud migration etc. while investments in the adoption of digital technologies in OT areas like improvements in efficiencies, maintenance, throughput etc. are getting postponed.

- **The emergence of new-age digital project management solutions:**
  With increasing business uncertainly and reducing access to stable capital, Capex investments are at risk, and there is immense pressure on project teams to optimise sanctioned Capex projects. Many clients are beginning to look for the next set of smart project management solutions that help them optimise costs, reduce/delay risks and provide better real-time visibility of ground realities.

- **Digital engineering and digital tools:**
  Creation and management of assets using digital tools and the interfacing and collaboration of physical and digital assets. Building Information Modelling (BIM) is expected to gain ground as a reliable, shared knowledge resource for information and decision-making.

In line with the above key trends, we plan to strengthen our business on Industry 4.0, FEA and BIM. We also aim to grow our asset digitisation business and are focused on building an internal centre of excellence for digital engineering.

KEY ACHIEVEMENTS

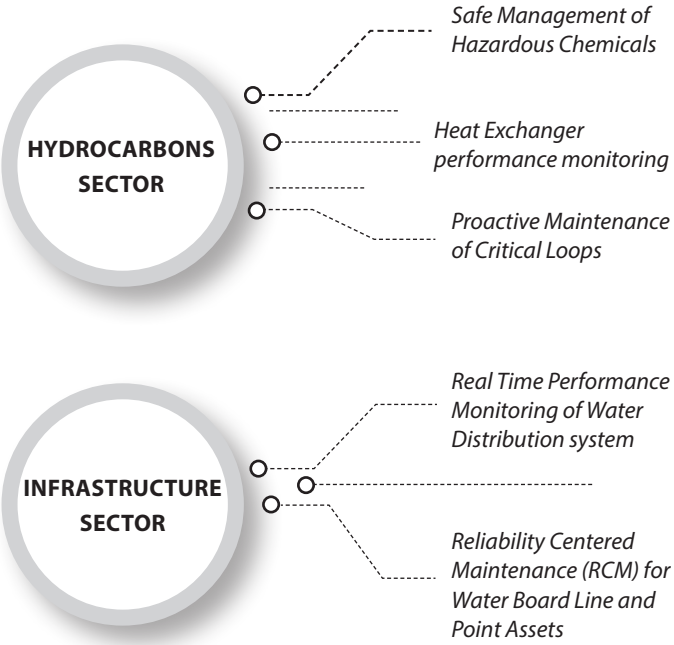
- **Some of the major projects completed by the DAT business unit include**

  1. Phase 1 of IOCL TDMS project – digitised and integrated 6 Lakh documents (drawings, 3D models, P&IDs, equipment datasheets) to create a contextualised engineering database (asset information model)
  2. Laser scanning and asset modelling project for Nayara Energy and HPCL (5 units)
  3. Detailed engineering of mobile launch pedestal for ISRO GLSV MK III Vehicle (to be used for India's Gaganyaan mission).
  4. Detailed engineering of an integrated cryogenic engine test facility for ISRO – design and detailed engineering of special-purpose equipment

Further to play the role of a System integrator, it is imperative to build a network of reliable partners for software, hardware, networking, cybersecurity, OEMs. Good progress has been achieved in this direction in FY 2020-21

- **Commercialisation of Point solutions**

As part of digitalisation services offerings, apart from introducing appropriate third party solutions in system integrator role, DAT BU, in collaboration with design business units are developing and commercialising TCE's Digital Point Solutions (DPoS), which is designed to address certain specific operational problems by deriving deep insights using domain knowledge and data analytics Some of the solutions under various stages of development and commercialisation include

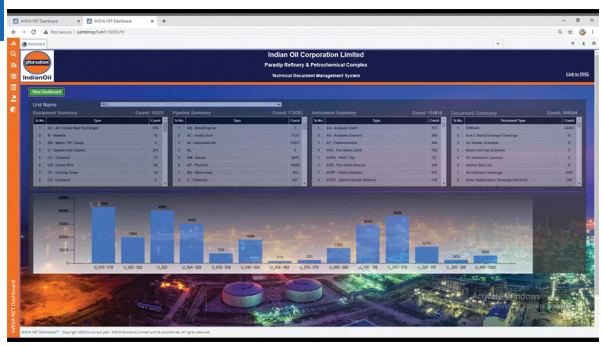


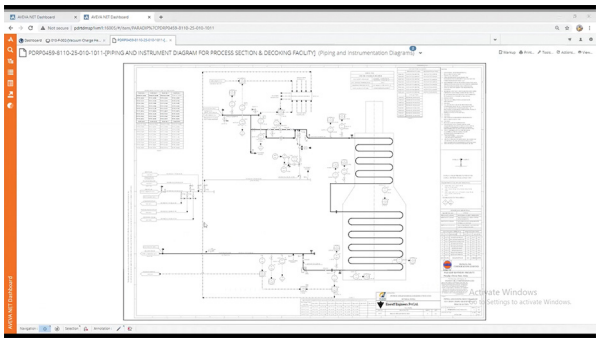
A PROJECT

Technical Document Management System (TDMS) at IOCL

Designed, supplied and installed TDMS compatible/conformed with ISO 15926 architecture standards or platform with all associated system architecture, hardware and software components, dependencies, licenses, installations, testing, training, and maintenance for refineries division of Indian Oil Corporation Limited.

- TDMS shall facilitate day-to-day information accessibility to the users via a web-based Interface and be a focal point for information for future engineering modifications, upgrades and plant operation
- Formulation and finalisation of tree structure type browser for all Refineries
- Any single document/information updated on any refinery that should be reflected at all refineries with a back-up at Refinery Head-Quarter
- Within a single click of a button, manage the 1D/2D/3D information





POWER SECTOR

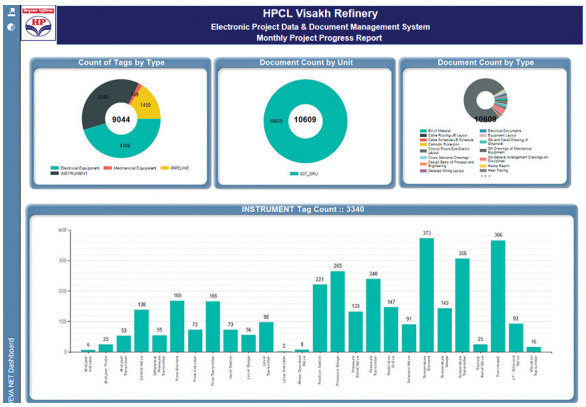
- *Boiler modelling and performance optimisation*
- *Coal inventory management & optimisation*
- *Power plant chemistry monitoring & diagnosis*
- *Condenser performance monitoring and optimisation*
- *Performance optimization for critical pumps*
- *Solar power forecasting solution*
- *Switchgear health & performance monitoring*
- *Transformer health & performance monitoring*

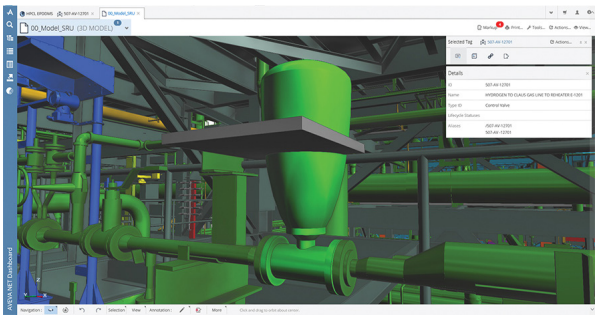
TCE SmartSITE Solution

PROJECT MANAGEMENT SECTOR

- *Paperless / Low Touch Construction Processes*
- *Dynamic Dashboard reporting from site to PMO / All Stakeholders*
- *Making Site members 'MOBILE' with cell phone application*
- *Collaborative Communication platform for all*
- *Safety Data Analysis - Suraksha portal - Real time Analysis of Safety Data*
- *Knowledge / Experience capture from Projects with EDMS and JCR*

- *Virtual Command Control Centre - SME Support in resolving technical issues*
- *Progress monitoring with drones and PTZ cameras*





A PROJECT

Implementation of Electronic Project Data & Document management system (EPDDMS)

Implementation of Electronic Project Data & Document management system for Visakh Refinery Modernization Project (VRMP) of M/S Hindustan Petroleum Corporation Limited, Vishakhapatnam (Andhra Pradesh) India

- EPDDMS shall facilitate day-to-day information accessibility to the users via a web-based Interface and be a focal point for information for future engineering modifications, upgrades and plant operation
- As-built data as handover to ensure that HPCL can leverage this data for Plant Operations and Maintenance
- Expected **5 Lakhs** documents and **2 Lakhs** Tags and **10** 3D Models
- To increase engineering efficiency and productivity in terms of Project Handover

TECHNOLOGY GROUP

The agility of response defines an organisation's ability to overcome challenges posed by disruptive technologies or natural disasters, which can render well-planned policies and risk mitigation measures ineffective. The COVID-19 pandemic that affected multiple businesses and geographies prompted the organisation to rethink business strategies to survive and turn the adversity into a growth opportunity.

03 New Productisation / Templatisation

08 New Solution Offerings

10 YouTube Videos

13 Whitepapers on the TCE website

23 Presentations in various conferences and **5** Panel Discussions

27 Papers published in reputed journals/ magazines

52 SMEs from TCE enrolled as members of various BIS committees

31 Articles written and uploaded on the company website

Technology group, which has traditionally been the knowledge backbone in consulting business, had to reinvent and accelerate work strategies aligned to business requirement. Business continuity plans required strong Work from Home (WfH) strategy implementation leveraging the digital platform.

In addition to revitalising and enhancing the organisation's existing knowledge base, the technology group also helped develop new technology area work resulting in business acquisition in emerging fields of green hydrogen and industrial energy transitions.

The technology group also took the leading role in promoting innovation culture in the organisation. The new initiatives of creating an innovation framework and promoting value engineering practice in projects are aimed to bring a difference in service to the customer. These initiatives were integrated with the business plans of the Business Units (BU's).

The significant contributions from technology group in the journey of reimagining, reinventing, and growth are:

TCE BRANDING

Publications and conference presentations reflect the depth of knowledge and rich experience of the organisation. The technology group and subject matter experts authored and facilitated such branding work at the national and international level, TCE's insight on technology trends, showcasing unique designs, and various services. TCE co-hosted a webinar on energy transition with TERI where initiatives on collaboration for strategies to mitigate climate change were discussed.

TCE is actively involved in the development of design standards and is associated with the BIS committee. Fifty-two subject matter experts from TCE currently represent various BIS committees for revising existing codes/developing new codes. 22 new members are awaiting confirmation. TCE is collaborating with renowned institutions like IIT-Bombay and IISc Bangalore to research and develop new and emerging technology areas for future commercialisation.

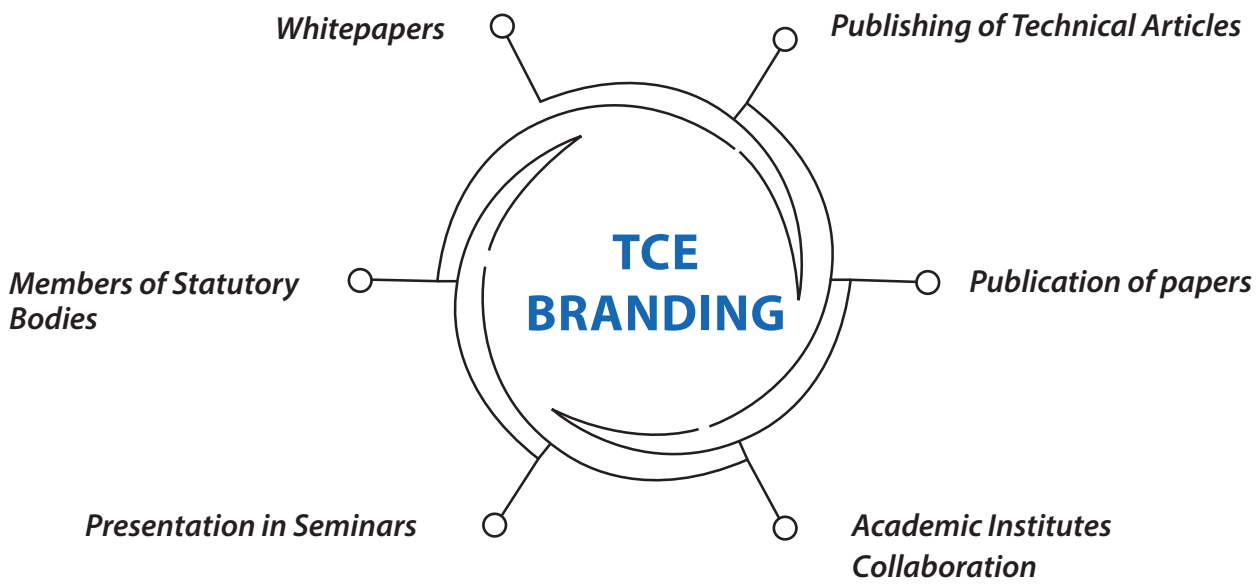
Institution of Engineers organises a flagship event every year, providing a broad technology platform.

TCE presented four technical papers in the 35th edition of the Indian Engineering Congress, a virtual event based on the theme "Engineering for Self-Reliance and Sustainable Goals". The paper titled "Green Hydrogen- A perspective" was adjudged as the best paper in the environmental engineering division.

To further enhance the connection with current and future customers, videos on trending technologies, biodiversity studies and complex and critical project solutions were created and uploaded on the company YouTube channel.

KNOWLEDGE SHARING VIA DIGITAL WAY

Knowledge sharing is fundamental to the collective knowledge, intelligence and abilities of an organisation. Virtual platforms served as essential means of knowledge dissemination under the Work from Home (WfH) scenario. Technology lecture series introduced under the Qlik2Learn initiative addressed technical training needs on state of the art engineering and technology to a broad audience across the organisation. Through 34 lecture sessions, domain experts expounded on a wide range of trending and exciting topics, followed by lively Q&A sessions. These lectures were recorded and available anytime, providing training on demand to the internal users. Such initiatives have helped TCE maintain and enhance service offerings to customers during the WFH scenario.



TCE Branding initiatives by Technology Group

PROJECT INNOVATIONS IN DESIGN ENGINEERING (PRIDE):

With an apt acronym PRIDE, this initiative allowed project teams to showcase and share the achievements in building value to our customers and help create a sense of pride in being part of such a unique team.

The second virtual knowledge-sharing e-Pride session was conducted in a new format. Separate sessions were conducted for each Business Unit (BU) involving 100 teams. Around 57 teams were shortlisted for the final presentation round, which was a live event. The participating teams submitted a pre-recorded video which was evaluated by a jury panel, and winners announced.

INNOVATION FRAMEWORK:

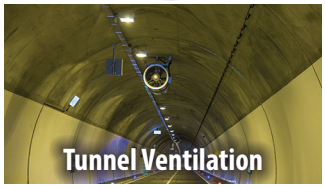
The ability to develop and launch new products & services relevant to the market on a sustainable basis defines any organisation. TCE's mission is "To provide Technically Excellent and Innovative Solutions for adding value for all stakeholders and operate globally as professional consulting engineers".

Innovation processes focus on creating and maximising value to the business, revenue generation through IP, differentiated value-added services, and creating market disruption to stay ahead of the competition. To promote an innovative culture in TCE, an innovation framework was set up with a detailed project plan, and clear objectives and deliverables monitored and reviewed. FY 2020-21 saw record number of 92 Innovista entries of which 23 moved to 2nd round.

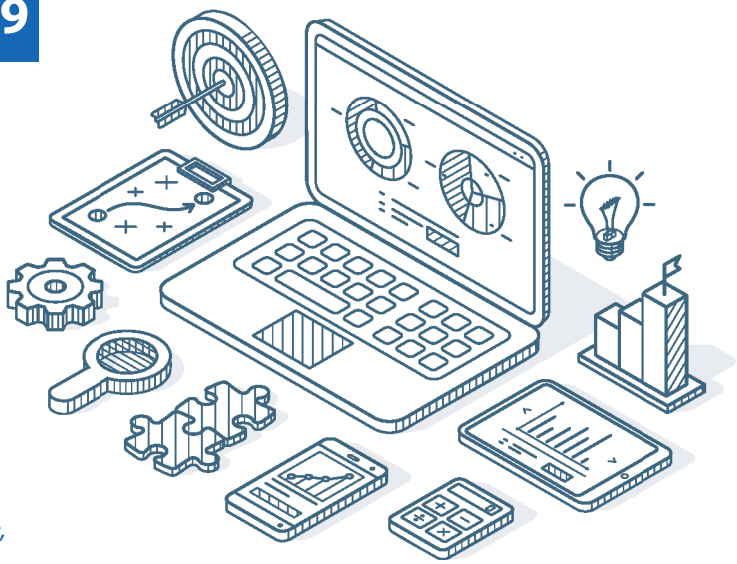
CRITICAL PROJECT SUPPORT:

To meet the challenges of remote working on technically challenging tasks, Discipline Heads engaged directly with project teams on various critical and challenging projects in new work domains. This included the Metro projects, High-Speed Rail terminal project, MSME projects where the Delivery Heads (DH's) handheld the team members to guide design solutions and create opportunities for developing standard design tools and products.

Highlights of the contribution by the Technology Group:



IT Initiatives during COVID-19



The COVID-19 induced lockdown last year caught everyone unaware. The employees were anxious and clueless about how to work and meet customer commitments. The traditional working methods were challenged, and organisations were forced to introduce Work from Home (WFH).

Suddenly the IT Department, which functioned silently in the background, became the centre around which the entire company operation revolved. Everyone realised the importance of these silent warriors.

Just like the employees, the lockdown was unexpected for the IT team as well. Transforming an entire organisation into a virtual workforce overnight was a herculean task for any IT team. Fortunately, TCE had its infrastructure ready. Within a short time, we could plan and align the resources to cater to the new ways of working and thus enabled business continuity.

The first step was to conduct user profiling based on the category of users, applications they used, and the mode of operation. Quickly actions were initiated to get each type up and running:

- Individual computing assets were moved to their residences
- For some, remote access to the office workstation over a secure VPN through their personal system was enabled.
- In some cases, secondary assets were arranged for employees who didn't have any personal computer for initiating remote access to their office systems.

OUR PILLARS OF SUCCESS:

1. Security

While we moved away from the office ecosystem and continued performing our roles from the home office, the organisation needed visibility of its people, assets, and data. As we move out of our corporate network's secured and protected environment to an open and unsecured internet, we needed to safeguard our systems and protect the data from external attacks, intruders, or leakage.

Enterprise Mobility Suite helped us extend Conditional Access, where only authorised company assets could access the data and download it, preventing data leak. In addition, we migrated our on-prem antivirus solution to AI/ML-based NextGen Antivirus and EDR solution on the cloud with more features and functionality, ensuring more visibility and control of end-user devices and better protection from cyberthreats. We also enhanced our Data Security layer by rolling out a DLP solution for endpoints.

2. Productivity

We enabled our employees with secured access to the project data and ported the required software licenses to their systems in advance, giving them an edge right from day 1. Subsequently, we migrated most of our licenses to the cloud to ensure continuous availability, concurrency, and effective utilisation.

3. Collaboration

TCE has been using Microsoft Teams, SharePoint and Integrated Document Management System and has practised collaborative work culture for many years. This helped our employees get acquainted with the remote work culture faster.

4. End-user Support and Awareness

IT Helpdesk team provided support to our employees round the clock over all communication channels to help this transition. We ensured that our task force gets the necessary support from hardware vendors at their doorstep. IT Team engaged in frequent communications with all the employees to keep their systems safe and advised them to follow standard security hygiene practices. Periodic emailers were sent out to all employees to reiterate the awareness of Phishing, Malware, Ransomware and other online threats.

5. Infrastructure, the Next Steps

Being a future-focused organisation, we took proactive steps to address possible chances of network clogging that may arise in the future. Bandwidth was ramped up at all Internet gateways. Secondary communication links were introduced to avoid loss of productivity due to link failures.

Virtual Desktop Infrastructure was deployed to enable a smooth and enhanced remote work experience for 3D engineering application users. This solution could address the need for high graphic requirements, data availability, data security, and ease of access.

With work from home becoming a way of life, we at TCE are prepared to serve our customers from anywhere at any time.