

ANNUAL REPORT

2022-2023

APPROACH TO REPORTING

The Annual Report is aimed at meeting the information requirements of all TCE Stakeholders, including Investors, Customers, Suppliers, Employees, Contractors, Competitors, Press, Analysts, the Government and others.

SCOPE OF THE REPORT

TCE has presented the information on all its business units in a fair, balanced and understandable manner. The performance disclosure is reported for the period FY 2022-23.

MANAGEMENT REVIEW

For optimal presentation of the information in the Report, the Strategic Framework, Governance Overview, Performance and Value Creation Model have all been perused by the Senior Management.

FORWARD-LOOKING STATEMENT

This Annual Report and other statements – written and oral – that TCE periodically publishes contain forward-looking statements that set out anticipated results based on the Management's plans and assumptions. The Company has tried, wherever possible, to identify such statements using suitable words in connection with any discussion on future performance. TCE cannot guarantee that these forward-looking statements will be realised, although the Company believes it has been prudent in its assumptions.

The achievement of results is subject to risks, uncertainties and even inaccurate assumptions. Should known or unknown risks or uncertainties materialise or underlying assumptions prove inaccurate, actual results could vary materially from those anticipated, estimated or projected. TCE undertakes no obligation to publicly update any forward-looking statement, whether as a result of new information, future events or otherwise.

MATERIALITY

The Report includes information that the Senior Management of TCE believes is material to the Company's Stakeholders. It presents an overview of TCE businesses and associated activities that help in short, medium and long-term Value Creation. The Company has presented information around its strategic approach.

REPORTING PRINCIPLE

Through the Report, TCE is attempting to present its '*Integrated Thinking*' process by aligning its communication with the International Integrated Reporting (IR) Framework by the International Integrated Reporting Council (IIRC) and the Companies Act, 2013. The Report tries to communicate a clear, concise, integrated story that explains how all resources of TCE create value for the business and its Stakeholders.

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Tata Consulting Engineers Limited (TCE) is an Integrated Engineering Consultant providing Concept to Commissioning services in [Infrastructure, Power, Resources - Hydrocarbons and Chemicals and Resources - Mining and Metallurgy](#) sectors.

TCE is a 100% subsidiary of Tata Sons. The Tata Group is one of India's most respected conglomerates.

SUSTAINABLE SOLUTIONS FOR A BETTER TOMORROW

Established in 1962, Tata Consulting Engineers Limited (TCE) is India's leading Integrated Engineering Consultant providing Concept to Commissioning services. With 11,000+ projects delivered in 64 countries, the Company has recorded a tremendous growth in revenue of 27% this year.

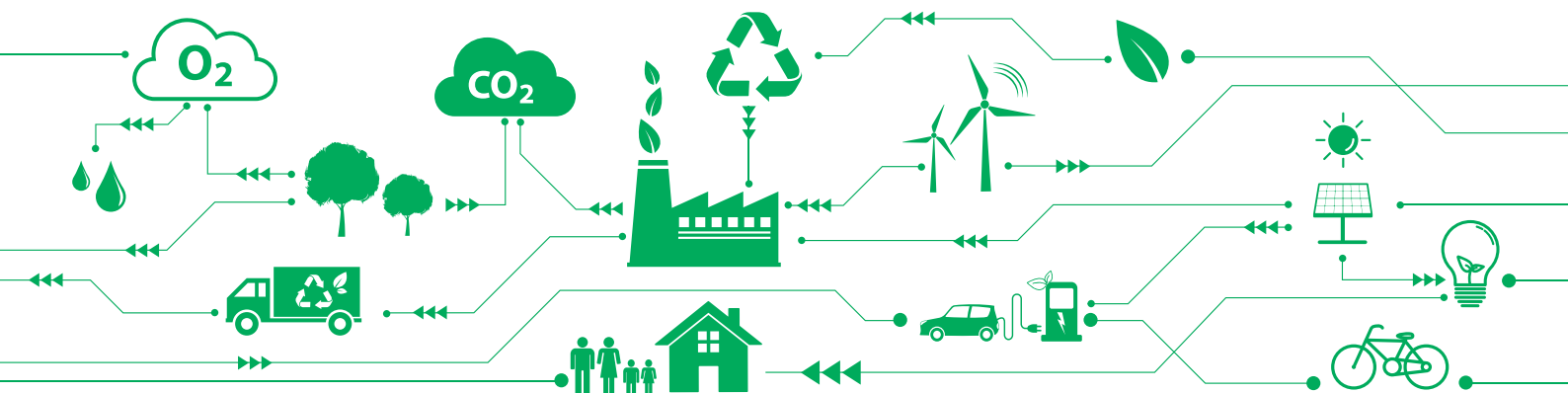
The Company is amongst the top 2 consultants in its core sectors – Power, Infrastructure and Resources. It is powered by its people's solid knowledge base and technical expertise, helping it deliver several one-of-its-kind projects.

TCE has a multi-disciplinary engineering talent capable of managing complex projects worldwide and is amongst the few companies geared for Industry 5.0 era, providing engineering solutions for the Industrial Internet of Things (IIoT).

Providing Sustainable Solutions for a Better Tomorrow is the mantra that guides TCE, which is at the forefront of providing sustainable development solutions to clients for projects. The engineering teams at TCE provide thought leadership in shaping sustainable solutions across all sectors of power, infrastructure and industrial engineering projects.

The Company has engineered many projects incorporating principles of Green Building Construction (GBC), Zero Liquid Discharge (ZLD), conversion of solid Waste to Energy (WtE) and providing Net Zero Solutions for industrial development and human habitation development projects. The vast and unique knowledge and expertise accumulated through years at the forefront of engineering projects in energy, process plants and public infrastructure development works lends itself aptly towards interweaving sustainability into the solution fabric.

TCE has an extensive and in-depth understanding of sustainable solutions involving renewable power (solar, hydro, nuclear and wind), electric vehicles and their battery manufacturing, EV Charging Infrastructure through renewables, Battery Energy Storage Systems (BESS), Planning and Design of Microgrids, Smart City Planning, Green Hydrogen for Power and Industrial Operations. TCE has been providing solutions in these fields, carrying out studies and developing schemes for energy audits and improving process and energy use efficiency in different industries.



CORPORATE SNAPSHOT

60+ YEARS
OF ENGINEERING
EXCELLENCE

1137 CR
TOTAL CONSOLIDATED
INCOME FY 2022-23

11000+
PROJECTS DELIVERED

\$35 BN
WORTH PROJECTS
UNDER MANAGEMENT

IN
64
COUNTRIES

5073
WORKFORCE AS ON
31ST MARCH 2023

06
PATENTS

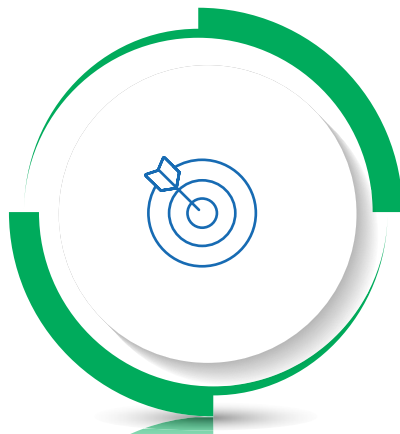
1586 CR
BUSINESS ACQUISITION

PILLARS OF SUCCESS



VISION

To be an Internationally Respected Engineering Consultant offering Comprehensive Solutions.



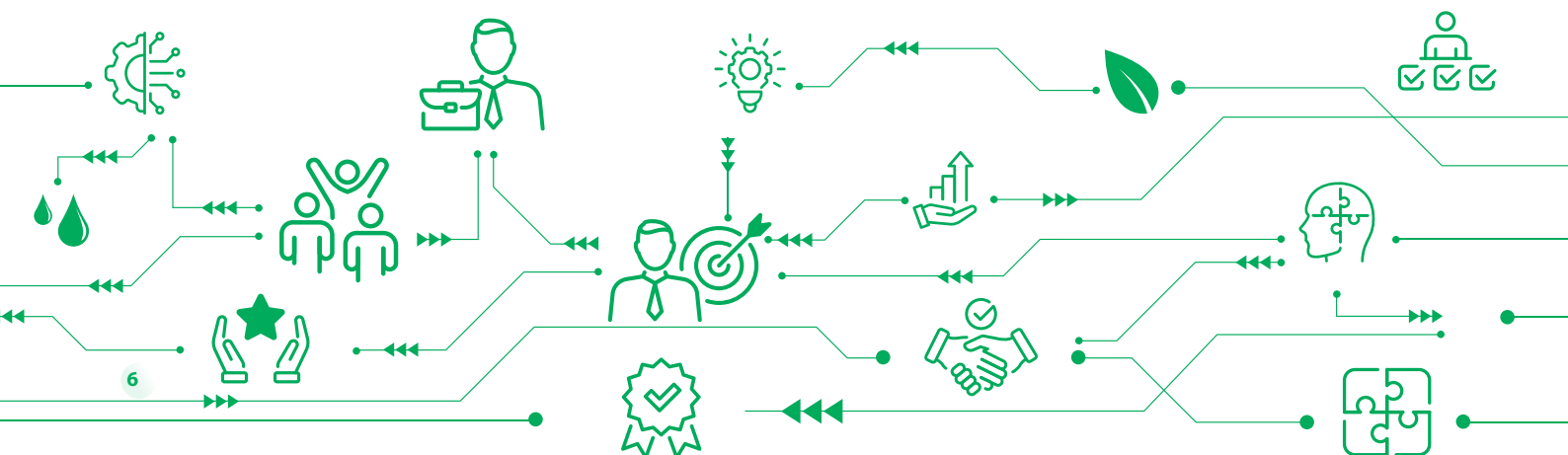
MISSION

Provide Technically Excellent and Innovative Solutions for adding Value to all Stakeholders and Operate Globally as Professional Consulting Engineers.



VALUES

- Customer Satisfaction & Loyalty
- Technical Excellence with Professional Ethics
- Responsibility to Society
- Employee Dignity & Self-respect
- Organisational & Individual Growth



VALUE DRIVERS

CUSTOMER FOCUS

At TCE, staying alive to the customer's needs is paramount. Customer focus is a key parameter of employee goals, thus maximising customer loyalty and fostering a culture of customer first.

SYSTEM MINDSET

The system mindset of the Company ensures parity of experience and delivery to its customers. Applications such as SmartSite™ and Suraksha deliver real-time and paperless project management experience.

INNOVATION CULTURE

TCE encourages a creative mindset by motivating employees to participate in ePride and Tata Innovista contests. The Company also has a mechanisms to capture value additions at the project level and a platform to share the learnings with other project teams.

WORLD CLASS TALENT

People are TCE's most important asset and the Company believes in constantly upskilling its talent to keep pace with changing times. TCE ensures an inclusive, innovative, meritocratic and people-centric culture.

INDUSTRY EXPERTISE

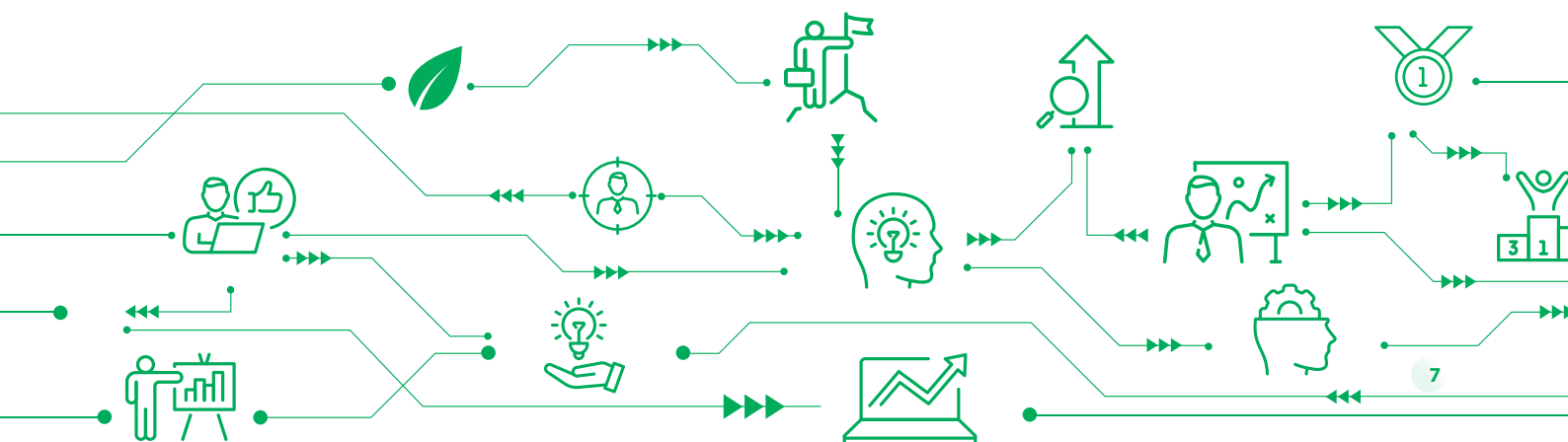
TCE's deep domain expertise across various industry segments gives the Company a competitive advantage and helps design out-of-the-box technical solutions to save customer time and money.

TATA VALUES

TCE is committed to integrity and adhering to the Tata Code of Conduct (TCoC) developed by the Tata Group. The Company has institutionalised well-thought-out stringent practices and processes to ensure a high standard of ethical conduct and compliance.

THOUGHT LEADERSHIP

As thought leaders in the industry, TCE holds the merit of shaping industry mindset, leading new domains, delivering complex & unique projects and value engineering.



SECTORS

50%
SHARE OF REVENUE

PLANT ENGINEERING CLUSTER

POWER SECTOR

Nuclear, Green Power (Solar, Wind, Hydro), Thermal and Transmission & Distribution

RESOURCES - HYDROCARBONS & CHEMICALS SECTOR

Oil & Gas, Petrochemicals & Refineries, Food & Pharma, Specialty Chemicals

RESOURCES - MINING & METALLURGY SECTOR

Ferrous & Non-Ferrous, Geology & Mining, Beneficiation and Material Handling

47%
SHARE OF REVENUE

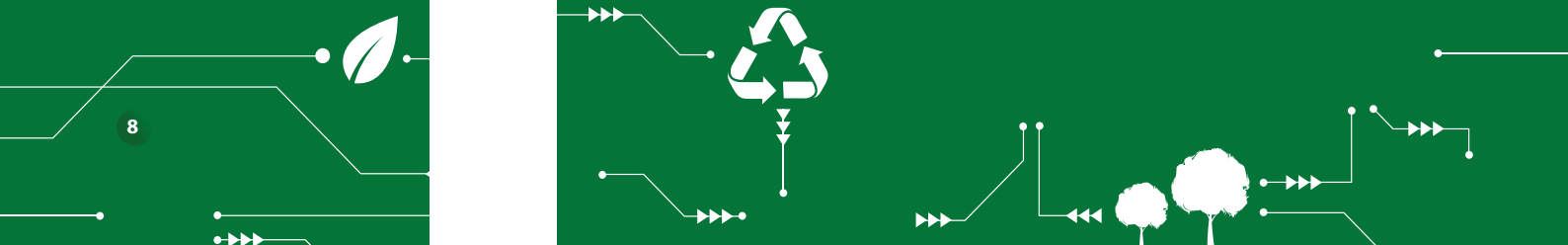
INFRASTRUCTURE CLUSTER

INFRASTRUCTURE SECTOR

Water, Wastewater & Sewage, Buildings & Facilities, Environment & Sustainable Infrastructure, Industrial & Manufacturing Facilities, Master Planning & Urban Development and Ports & Transportation

ECOFIRST SERVICES LIMITED (SUBSIDIARY)

Sustainable Integrated Design of Buildings, Urban Design, Sustainable Engineeconomics, Climate and Sustainability Services, Program Management, Digital & Modelling



SERVICES

DESIGN & ENGINEERING

- Project Concept Development
- Pre-feasibility & Feasibility Reports
- Detailed Project Reports
- Environmental Study Reports
- System Studies
- Basic Engineering
- Frontend Engineering Design (FEED)
- OE Services
- Detailed Engineering

SUSTAINABILITY SOLUTIONS

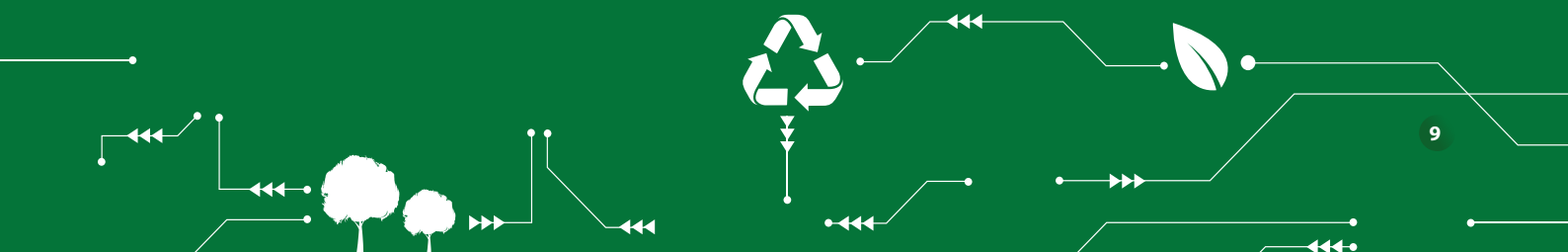
- Clean and Renewable Energy
- Green Infrastructure
- Green Fuels and Chemicals
- Green Steel & Cement
- Energy Transition Technologies

DIGITAL & ADVANCED TECHNOLOGIES

- Unified 3D Engineering, 4D, 5D Simulation
- Building Information Management
- Asset Digitisation & Asset Information Management
- Industry 4.0 & Asset Performance Management
- Product Engineering - Design and Analysis
- Turnkey Machine Development

PROJECT MANAGEMENT & SAFETY

- Project Management
- Engineering & Constructability Review
- Construction Management / Supervision
- Program Management
- Interface Management
- Quality & Safety Audits
- Outage & Opex Management
- Procurement Management



PERFORMANCE HIGHLIGHTS

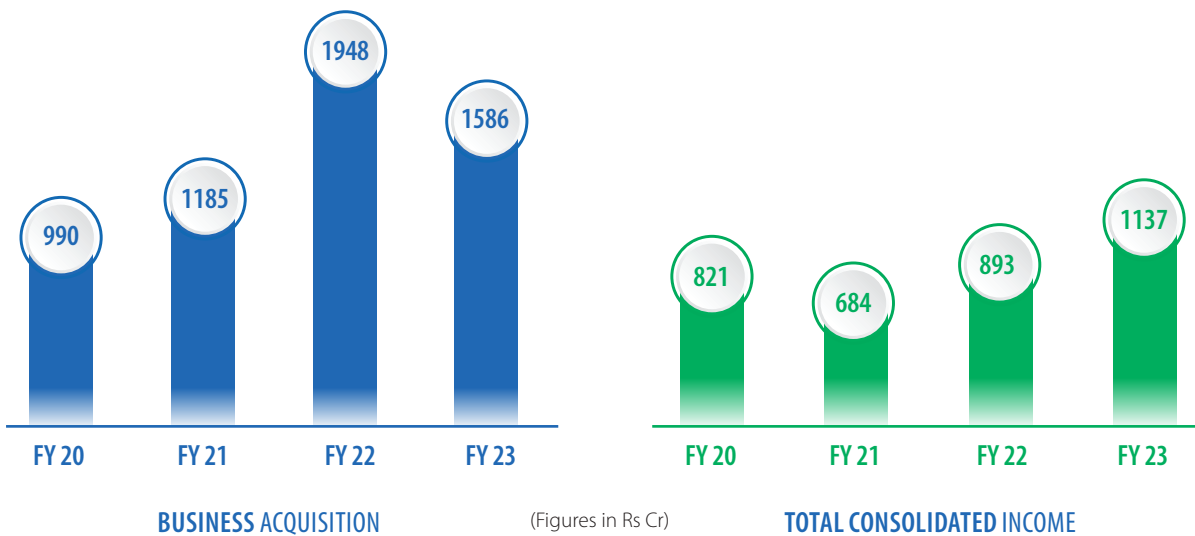
FINANCIAL CAPITAL

FY 2022-23 proved to be an exceptional year for the Company. The year closed at Rs 1137 Crores in total consolidated income, highest ever and Rs 1586 Crores in order acquisition.

1137 CR
TOTAL CONSOLIDATED
INCOME

1586 CR
BUSINESS
ACQUISITION

27%
GROWTH IN INCOME
OVER PREVIOUS YEAR



MANUFACTURED CAPITAL

18
PROJECT, SALES AND
BRANCH OFFICES

Project design, engineering, construction, maintenance and management are the stages when TCE uses materials, equipment, tools and technologies, these form the Company's manufactured capital

NATURAL CAPITAL



Efficient operations and optimal use of natural resources ensure all TCE business activities have minimal impact on the environment. Through its technology-enabled solutions, the Company also helps its clients in preserving natural resources.

INTELLECTUAL CAPITAL

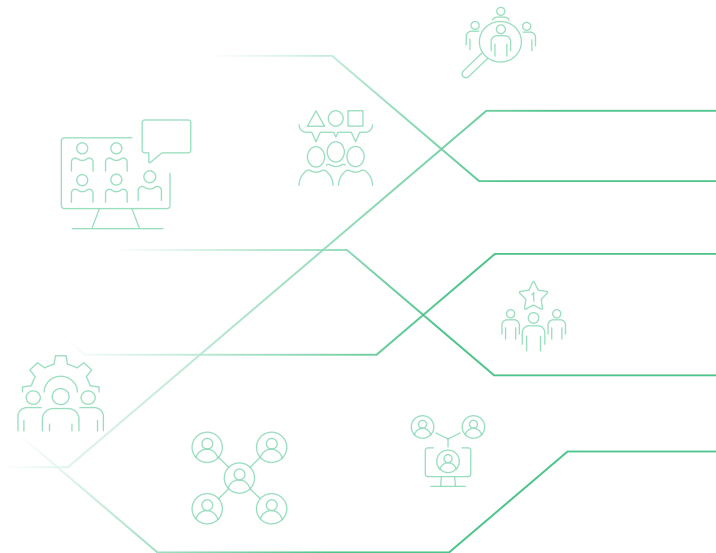
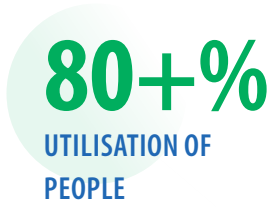
The technology group of TCE is the engine behind the intellectual capital of the Company.

Entrusted with the responsibility of continuously generating knowledge, this group keenly analyses projects and provides technical knowhow to uplift the project design and delivery.



HUMAN CAPITAL

People are the most important asset of TCE. Collective skills, knowledge and capabilities of the employees and contract staff is core to delivering customer aspiration.



SOCIAL & RELATIONSHIP CAPITAL

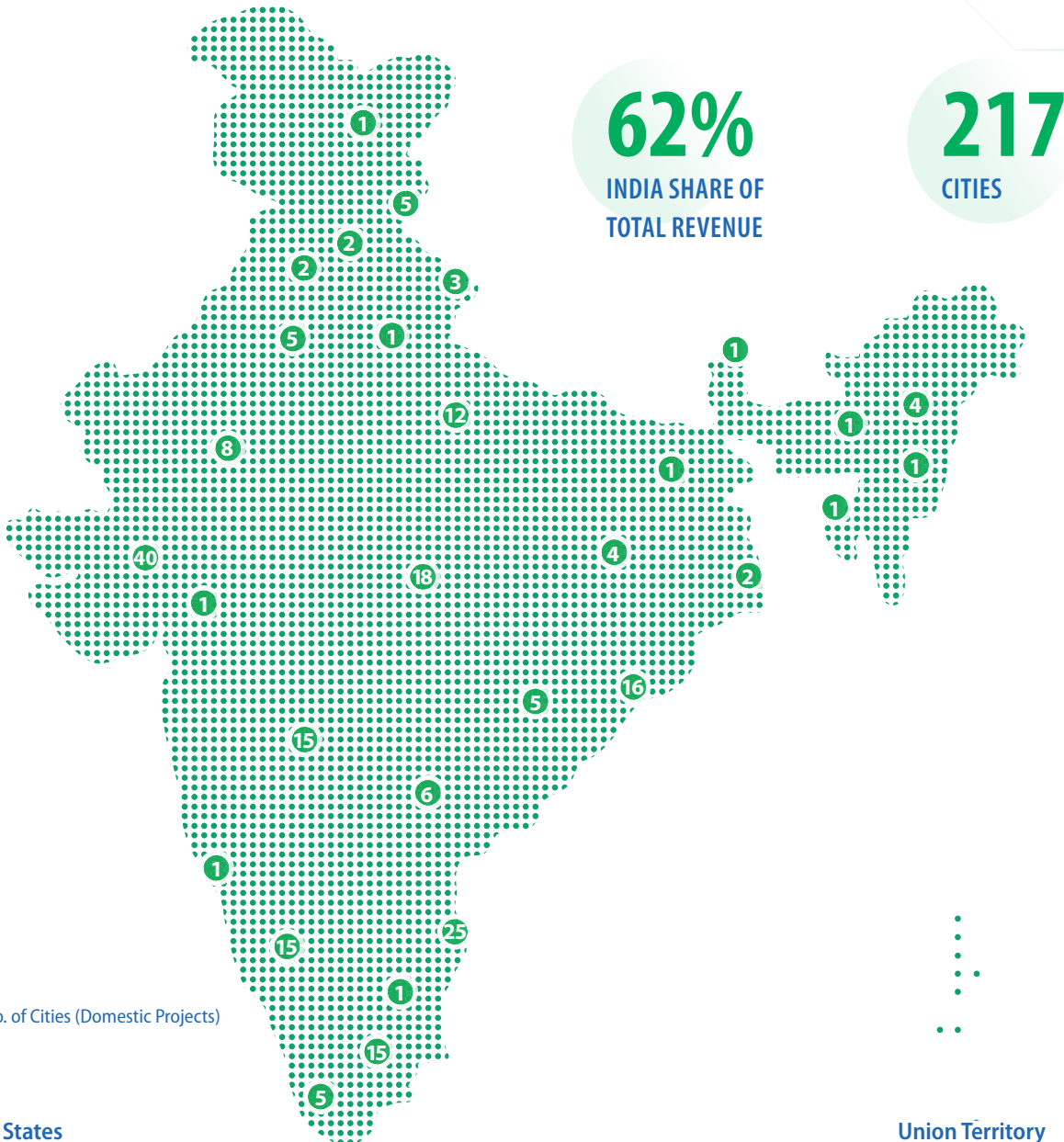
Powered by different flagship programmes and various volunteering initiatives, TCE is delivering its social responsibility. The Corporate Sustainability Policy framework offers the foundation to build social well-being programmes by leveraging TCE's core capabilities.

The primary focus areas are Sustainable Livelihood, Education, Infrastructure and Health and Hygiene.



PRESENCE

INDIA



62%
INDIA SHARE OF
TOTAL REVENUE

217
CITIES

● No. of Cities (Domestic Projects)

Indian States

- | | | | |
|-------------------|---------------------|---------------|-------------------|
| 1. Assam | 8. Himachal Pradesh | 15. Manipur | 22. Tamil Nadu |
| 2. Andhra Pradesh | 9. Jammu | 16. Meghalaya | 23. Tripura |
| 3. Bihar | 10. Jharkhand | 17. Odisha | 24. Uttar Pradesh |
| 4. Chhattisgarh | 11. Karnataka | 18. Punjab | 25. Uttarakhand |
| 5. Chandigarh | 12. Kerala | 19. Rajasthan | 26. West Bengal |
| 6. Gujarat | 13. Madhya Pradesh | 20. Sikkim | |
| 7. Haryana | 14. Maharashtra | 21. Telangana | |

Union Territory

1. Chandigarh
2. Dadra and Nagar Haveli
3. Delhi
4. Ladakh
5. Puducherry

Map not to scale



NORTH AMERICA

- 1. Canada
- 2. Mexico
- 3. USA

SOUTH AMERICA

- 4. Brazil

EUROPE

- 5. France
- 6. Germany
- 7. Italy
- 8. Netherlands
- 9. Portugal
- 10. Spain
- 11. Switzerland
- 12. Turkey
- 13. UK
- 14. Ukraine

AFRICA

- 15. Algeria
- 16. Congo
- 17. Egypt
- 18. Ethiopia
- 19. Ghana
- 20. Kenya
- 21. Liberia
- 22. Libya
- 23. Malawi
- 24. Mauritius
- 25. Mozambique
- 26. Nigeria
- 27. Rwanda
- 28. Senegal
- 29. Seychelles
- 30. Sierra Leone
- 31. South Africa
- 32. Sudan
- 33. Tanzania
- 34. Uganda
- 35. Zambia

AUSTRALIA

- 36. Brisbane
- 37. Sydney

ASIA

- 38. Bahrain
- 39. Bangladesh
- 40. Bhutan
- 41. China
- 42. Fiji Islands
- 43. India
- 44. Indonesia
- 45. Japan
- 46. Jordan
- 47. Kuwait
- 48. Laos
- 49. Lebanon
- 50. Malaysia
- 51. Myanmar
- 52. Nepal
- 53. Oman
- 54. Philippines
- 55. Qatar
- 56. Saudi Arabia
- 57. Singapore
- 58. South Korea
- 59. Sri Lanka
- 60. Thailand
- 61. UAE
- 62. Uzbekistan
- 63. Vietnam
- 64. Yemen

38%
INTERNATIONAL SHARE
OF TOTAL REVENUE

COMPANY AWARDS

POSH AWARD

one of the Top 25 Safest Workplaces in India

L&D CONFEX & AWARD

for Best Leadership Transformation

WORLD HAPPINESS CONGRESS AWARD

for Best Employee Wellbeing

LEARNING & DEVELOPMENT AWARD

for Best Onboarding Program of the year

THE HAPPIEST WORKPLACE AWARD

for focusing on employee wellbeing and employee happiness

L&D SUMMIT AWARD

for evolution of Learning & Development

21ST ICSI NATIONAL AWARD

for Excellence in Corporate Governance

ASIA'S BEST EMPLOYER BRAND AWARD

for Excellence in Training

HR EXCELLENCE AWARD

for Leading Practices in Learning & Development

FICCI CORPORATE SOCIAL RESPONSIBILITY AWARD

for TCE's contribution to India's Fight against COVID19

INDIA RISK MANAGEMENT AWARD

for Masters of Risk in Real Estate and Infrastructure Sector MID-CAP Category

TATA INNOVISTA DESIGN HONOUR AWARD

for the design of retractable arm GSVL MK III to ensure retraction of umbellicals and safe satellite launch



MEMBERS OF THE BOARD



Ashok Sethi
Chairman



Sriram Kadiyala
Director



Anjali Kulkarni
Director



Amit Sharma
Managing Director & CEO

MANAGEMENT TEAM

BUSINESS FACING



S Vidyanand
Chief Operating Officer
Till April 04, 2023



Rajashekhar R Malur
Cluster Head - Plant Engineering & Design



B R Parthasarathy
Cluster Head - Infra, Sustainability & PMC



Rajat Kaushal
Head - International Mktg & Business Dev



Pravinchandra R Shahu
CIO & Head - Digital

BUSINESS ENABLING



Sridhar Radhakrishnan
Chief Financial Officer



Ms. Nidhi Mehandiratta
Head - HR, CSR & Ethics



Sachin Mishra
Head - Legal & Company Secretary



Atul Choudhari
Chief Technology Officer



Himanshu Joshi
Head - Strategy and M&A

SUBSIDIARIES

EcoFirst Services Limited



Chitrnanjan Kaushik
Chief Operating Officer, Ecofirst

Board of Directors

Amit Sharma
Chairman

Rajashekhar R Malur
Director

B R Parthasarathy
Director

Tata Engineering Consultants
Saudi Arabia



Ashwani Sadhu
General Manager

CHAIRMAN'S STATEMENT



“The world is in another disruptive era driven by sustainability, circularity and energy transition. For businesses, this means taking a holistic approach to how they operate – from their products and services to their supply chains and waste management. Tata Consulting Engineers Limited (TCE) set forth in this direction in the last few years. As a result, the Company is geared up to serve its customers with a suite of Sustainability Solutions.”

The year FY 2022-23 closed with new highs, TCE crossed the 1000 Crores revenue mark and met almost all targets set at the beginning of the financial year. The Company also celebrated its Diamond Jubilee with Group Chairman, Shri N Chandrasekaran, Chairman - Tata Sons gracing the occasion as the Chief Guest. This year, TCE continued to deliver satisfactory performance on significant projects like ITER in France, Copper Smelter in Indonesia, Fertiliser plant in Nigeria, SABIC in Middle East and prestigious projects in India like Ram Janmbhoomi Temple, High-Speed Rail, Central Vista and CIDCO affordable housing.

Over the years, there has been a significant shift in the way of providing engineering services owing to customer demand for early completion of projects at reduced costs. With the advent of digital technology and tools like 3D/4D modelling and other simulation processes, TCE has managed to surpass customer expectations and has optimised the construction time and provided various value engineering solutions.

Several in-house efficiency improvement and productivity enhancement initiatives have helped TCE attain a leadership position in the market and have embedded value engineering in the culture and DNA of the organisation.

The world is in another disruptive era driven by sustainability, circularity, and energy transition. For businesses, this means taking a holistic approach to how they operate – from their products and services to their supply chains and waste management. Keeping in pace with the global megatrends indicating strong momentum in the energy transition, TCE has taken the lead in creating integrated end-to-end solutions for its customers in all segments. Leveraging the Company's experience and presence in wide sectors, TCE has developed a complete portfolio of solutions covering all aspects of energy transition from green and clean energy generation to energy storage to green technology implementation.

ENERGY GENERATION, STORAGE & GREEN PROCESS



- **Power Generation:** Renewable Power, Clean (Nuclear) Power
- **Green Chemicals:** Hydrogen, Ammonia, Methanol etc.
- **Energy Storage:** Battery Energy, Pumped Energy (PSP), Hydrogen Energy
- **Green Fuels:** Bioethanol, Sustainable Aviation Fuel, Waste to Energy
- Nuclear Fission (Fleet Mode & Small Modular Reactors) & Fusion
- Plant Retrofits with Carbon Capture & Utilisation

RESOURCES: MINING AND CONVERSION



- **Green Metals:** Steel
- Smart Factory, Zero Solid, Liquid, Gas Discharge
- Environmental Services, Waste Management
- Circularity / Recycle and CCUS
- Green Cement and Infrastructure Waste Recycling and Utilisation

INFRASTRUCTURE & BUILDING SUSTAINABILITY SOLUTIONS



- Net Zero Development (Carbon, Water, Waste)
- ESG Policy & Implementation
- Sustainable Integrated Design of Buildings, Green Building Certification
- Carbon Reduction Solution
- Smart Cities, Sustainable Transport, Multi-Modal Hub, Green Ports

TCE is executing several first-time projects such as green ammonia, green hydrogen, green methanol, energy storage, bioethanol etc. making its strong presence felt and is already a market leader with an early mover advantage.

In the Green and Clean Energy space, apart from solar/wind based energy generation projects, TCE has also been involved in multiple Pumped Hydro Storage projects, aligning itself with India's ambition of increasing renewable energy share in the overall energy basket. TCE is also engineering one of the largest Solar PV Panel manufacturing facility in India.

As the electric vehicle market is growing, several battery manufacturing plants are currently under consideration, TCE is already part of some of the first few plants coming up in India making its presence felt in the entire value chain of energy transition technologies.

TCE has also made inroads into providing sustainable solutions to its customers in hard-to-abate industries such as steelmaking.

All this was possible due to the company's vision, strategic alignment, strong task force and talent pool geared up to provide differential value-added solutions.

FINANCIAL PERFORMANCE

TCE showed remarkable performance in all businesses this year. In FY 2022-23, the Infrastructure Cluster acquired 48% of the total acquisition and secured 47% share in revenue. The Plant Engineering and Design Cluster acquired 49% of the total acquisition and secured 50% share in revenue. The Digital and Advanced Technology business revenues more than doubled in FY 2022-23 as compared to FY 2021-22.

TCE achieved consolidated total revenue of Rs. 1137 crores for FY 2022-23, a 27% jump. The domestic component was 62% and the international was 38%. TCE ranked 111 on the ENR, moving up a few places from 118 last year.

The business acquisition for FY 2022-23 reached Rs. 1586 crores on its strong order book and credentials, TCE is optimistic of scaling newer heights.

TCE has delivered robust performance over the last 10 years – orders secured has grown 2.5X, revenues went up by 2.6X and PBT grew by 5.9X of what they were in FY13. This has been made possible by strategic actions such as expansion to international markets, entry into new sectors/ services, creation of annuity linked business models, organisation structure innovation and investment in digital tools and systems to name a few.

GOVERNANCE & SYSTEMS

TCE is a pioneer in good governance practices with established systems and processes to enforce the same. Anti-bribery & Anticorruption, Prevention of Sexual Harassment (POSH) at the workplace, adherence to the General Data Protection Regulation (GDPR), Whistle-Blower Framework and others have been institutionalised through policies and guidelines. IT systems have strengthened business processes, making for a transparent mechanism to protect client IPR and build client confidence.

The risk management process has been reinforced with a clear focus on addressing and mitigating material risks to TCE. The Company has implemented robust risk management systems and procedures across the organisation. TCE was awarded as 'Masters of Risk - Real Estate and Infrastructure Sector - Mid-Cap Category' at the CNBC-TV 18 India Risk Management Awards. TCE also made its place among the top 25 Safest Workplaces in India at the KelpHR PoSH Awards.

The Company is actively working on strengthening the risk culture, ~25% employees across the company were trained on various aspects of Risk Management.

CORPORATE SOCIAL RESPONSIBILITY

As a Corporate Citizen, TCE continued to contribute towards social upliftment by creating sustainable impacts through its Corporate Social Responsibility ("CSR") initiative "TCEndeavour". TCE believes in and supports inclusive economic development and contributes towards asserting the fundamental right of education.

The Company's CSR projects focus on holistic development and sustainable social impacts. The areas of interventions include improving the quality of education at grass root level in STEM fields, skill development projects to close the opportunity gap and generate a sustainable stream of income and elevate the standard of living and disaster recovery initiatives focused on reviving schools in impacted areas.

The various CSR initiatives are covered under the larger themes of the CSR policy at TCE

- Education
- Sustainable Livelihood
- Infrastructure Development and
- Healthcare
- Academia Collaboration

This FY 2022-23, TCE reported 200 volunteering programs investing 15616 person-hours. FICCI also recognised the Company for its efforts in supporting the Nation in its fight against COVID-19.

PEOPLE

TCE is proud to be home to a diverse workforce from various ethnic, regional and cultural backgrounds. Its multi-generational workforce brings with it a rich blend of educational and professional experience. TCE's employee value proposition (EVP) is built around the idea that its employees are the most valuable asset.

The Company recognises that its success as an organisation is inextricably linked to the success of its workforce. TCE strives to provide a workplace environment that is challenging, rewarding and supportive. Investing in the well-being of its employees and providing opportunities for career advancement are the core tenets of the employee value proposition, making TCE the employer of choice to attract and retain the best minds in the industry.

This year through continued dedicated efforts and strategic recruitment, the Company ramped up its workforce through various sourcing channels such as campus recruitment, walk-in drives, social media campaigns, strategic partnerships in hiring, ex-pat onboarding etc. The workforce strength grew significantly by around 26%, which is a testament to the Company's commitment to growth and expansion.

This FY 2022-23, the Company invested 30+ person-hours per employee on training, including training on digital engineering delivery mechanisms.

The Company was awarded HR Excellence in Learning and Development by various forums like People First, Leadership Summit and L&D Summit Awards. The Company also became the Happiest Workplace for focusing on employee well-being and happiness.

With various milestones critical to keeping the ambition of the Paris Agreement so near, acknowledging the moment's gravity is increasingly clear for businesses across all sectors of society.

In addition to strong governance, TCE is working on equipping its workforce with the climate related knowledge and skills needed to maximise the impact of the decarbonisation focused business deliverables.

As thought leaders, TCE has also published various whitepapers to sensitise the customers and public at large on the sustainability trends and abatement options available.

Seeing that the world is moving towards a more inclusive and holistic approach is heartening. In due course, these approaches will mature and result in opportunities for TCE to contribute to engineering a sustainable tomorrow.

It has been a historic year for the Company. My best wishes to all employees, customers and partners who have placed their trust in TCE. I also thank the Management and the Board members of the Company for their valuable contribution to the success of TCE.

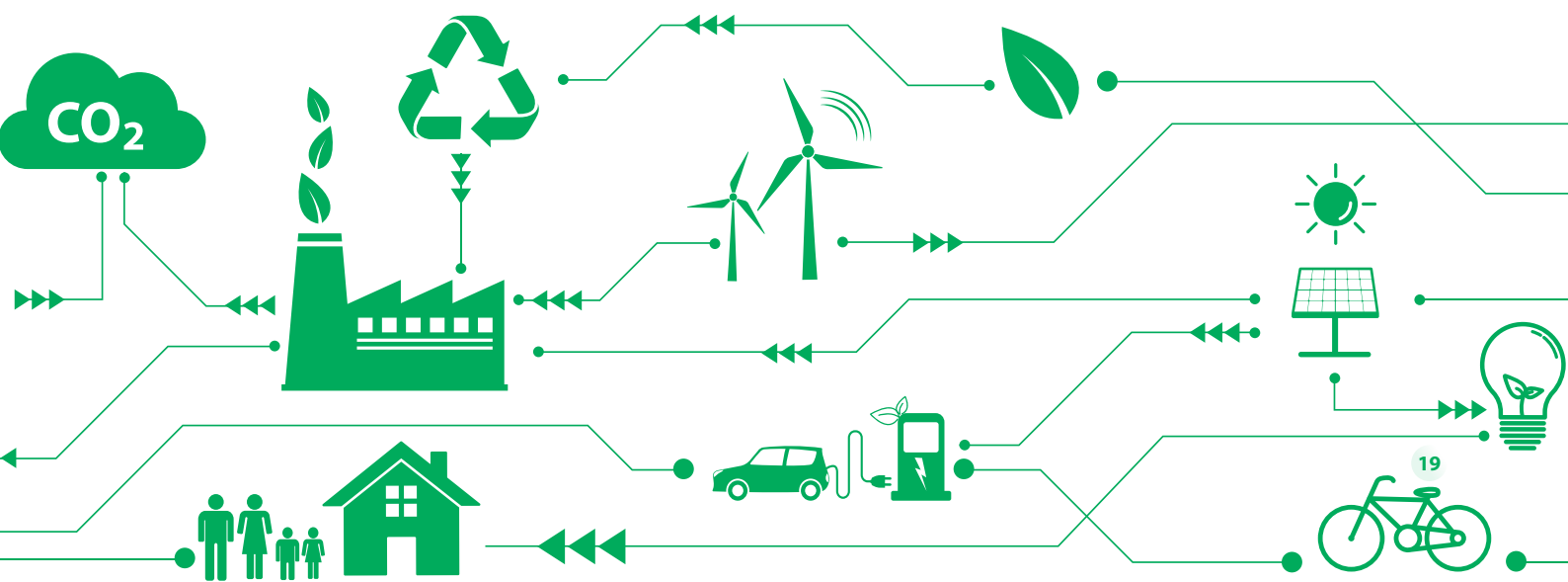
I look forward to TCE delivering enhanced value in the year ahead and beyond.

CONCLUSION

Globally, the realisation of Sustainability priorities like Infrastructure Imperatives, Carbon Management, Green Energy, Circular Economy, Environment Conservation, Water Conservation and Energy Efficiency is shaping policies and business plans.

Sincerely yours,

Ashok Sethi



MANAGING DIRECTOR'S STATEMENT



FY 2022-23, marked with the Diamond Jubilee of the Company, was remarkable for Tata Consulting Engineers (TCE) in more ways than one. Today, TCE is a 1000+ Crores Revenue turnover and 100% Debt-free Company – A Milestone year in TCE's journey.

FY 2022-23, marked with the Diamond Jubilee of the Company, was remarkable for Tata Consulting Engineers (TCE) in more ways than one. Today, TCE is a 1000+ Crores Revenue turnover and 100% Debt-free Company – A Milestone year in TCE's journey. As the Company enters the new financial year amidst rapidly evolving international macroeconomics, socio-political dynamics, energy security concerns, realignment of global supply chains and increasing focus on sustainability. TCE is cautious of the possible and probable global growth deceleration. On one hand, cost pressures on global Owners/OEMs in developed economies could lead to an increase in engineering outsourcing; on the other hand, increased protectionism may offset business potential.

TCE is also acutely aware of the possible risks in the global environment with the continuation of the Russia-Ukraine war, deepening debt crisis in developing countries, decoupling of the world economy and climate change impacts. However, on the positive side, these dynamics also provide renewed thrust by nations globally to explore energy security, realign their supply chains for critical and core materials with possible local production strategies and invest in keeping with the evolving decarbonisation thrust.

The Company has factored these actively into its business continuity plans and organisational strategies. In parallel, the India growth story continues to be robust, with strong domestic consumer demand, steady forex reserves and strong credit growth. FY 2023-24 budget was a huge positive with its continued focus on increasing capital expenditure, the higher outlay for infrastructure development in rail transportation, urban development and schemes to stimulate investments in the manufacturing sector (PLI).

FY 2022-23 also saw significant movement on the ground with respect to Sustainability and Energy Transition initiatives. With the Indian Government's strong commitment to Energy Transition and the launch of the National Green Hydrogen Mission, most Government organisations and private enterprise have initiated their journeys to achieving the stringent net-zero targets.

TCE is also witnessing a rapid evolution in related technologies and business models with an "Energy as a Service" approach combining renewables, energy storage, efficient and smart grids and integrated energy markets. This creates challenges and opportunities for TCE's customers from the 'hard to abate' industries in terms of investments to reduce their carbon footprint and search for newer business and growth models. In almost all sectors where TCE operates, it will assist its customers in preparing their transition strategies, green pathways and plans in line with the GHG emissions-related targets.

With India hosting the G20, Government and Industry Leaders will unveil many policies, strategies and plans this year. TCE aspires to be a leading player in shaping sustainable infrastructure and the Net Zero journey by working with its customers, partnering with leading academic institutes and industry process and technology leaders and working closely with policymakers. The Company will also leverage deeper collaboration with the Tata Group Companies and thought leaders to deliver its Engineering Sustainable Solutions for a Better Tomorrow promise.

PERFORMANCE REVIEW

FY 2022-23 saw the highest growth in the Company's 60-year history. Total revenues grew 27% over the previous year closing at Rs 1137 crores. A well-balanced portfolio and the right mix of domestic and international projects helped achieve these numbers. In FY 2022-23, the new sales order intake closed at Rs 1586 Crores at the consolidated level.

- TCE deepened its strategic connect with Tata Steel, Aramco-Sabic, Reliance, Adani and Vedanta, to name a few, working across projects ranging from Circularity, Decarbonisation and Green Energy focus across multiple projects and global locations.
- Talent retention is an essential aspect of any consulting business. In FY 2022-23, the attrition increased from around 16% to around 20%. The Company has laid out a detailed plan to arrest the situation and the results will be seen in the coming years.
- TCE moved up in ranks in the ENR Top 225 International Design Firms to 111. In FY 2022-23, 38% of revenues and 34% of the business acquisition came from international markets.
- TCE's efforts in mapping the evolving Energy transition over the last five years have yielded promising results with multiple pilot plant projects made possible through leadership participation with policymakers and industry leaders. The projects are in various stages and focus on Hydrogen, Methanol Ammonia, Renewables, Nuclear and related areas of Circular Economy and Waste Management.
- TCE achieved the best-ever score of 600+ in the Tata Business Excellence journey. This score validates TCE's business potential and organisational maturity, led by experienced leadership and driven by a motivated workforce.
- TCE accelerated its Non-Fossil fuel Energy focus with the NPCIL 5 & 6 – 2 x 700MW PHWR and expansion at ITER-France. The Company is also taking leadership in creating the roadmap for the emerging area of Small Modular Nuclear Reactors.
- TCE expanded its partnership with the industry leader in Paints for engineering services for a new plant and multiple ongoing paint manufacturing plants in their portfolio.
- At present, two major copper smelters are being implemented globally and both are being engineered by TCE – a 500 KTPA plant in India and another 250 KTPA plant in Indonesia.
- TCE procured an order from a large Japanese firm for a Dedicated engineering team to work on Petrochemical Process units for providing 3D integrated engineering services for Process, Piping & Instrumentation work.
- TCE's other large projects, like High-Speed Rail, Ayodhya temple, CIDCO etc., are progressing well and are on track.



- The Company is also working on various strategic projects with multiple central and state entities across Infrastructure, Transportation, Education and Energy sectors.
- TCE teams won awards at various forums for the Company's Best in Class and Benchmarked practices in CSR, Ethics, HR, Risk Management, Project Execution and Work Practices.

TCE'S CORE ASSET - PEOPLE

TCE firmly believes that people are its core assets. The Company's robust Employee Value Proposition is centred on its commitment towards the growth and development of its employees.

As part of TCE's commitment to providing better career growth opportunities, in FY 2022-23, the Company launched "COMPASS" - TCE's career architecture and competency framework. Further, STAR, a flagship career acceleration program, also provides opportunities for growth and development to high-performing and high-potential employees to leap in their careers.

TCE is committed to creating a diverse and inclusive workplace that values and respects differences. The Company constantly fosters an environment where everyone feels included, respected and valued.

TCE's leadership spirit embodies empowerment, empathy and two-way communication and it encourages its leaders to tread the path of constant self-improvement and lead the way by example.

Guided by the Tata Code of Conduct (TCoC), TCE has deployed the Leadership of Business Ethics (LBE) framework that reflects its commitment to shared values and principles. In 2022, TCE attained an “Advanced” level of maturity rating in all pillars of the LBE framework, a first for its sector in the Tata Group.

FUTURE OUTLOOK

Integrated, Sustainable Offerings

While India continues its growth trajectory, the recent commitments at COP27 and its focus on milestone based Net Zero commitments will be the key drivers of growth planning and actions in the coming years for both policymakers and corporates. The Company sees the future with tremendous opportunities for growth, inventions and innovations.

With a focus on Sustainable Infrastructure, Energy transition, increased electrification across all industries, shift to green chemicals, circular economy, new modes of energy pathways and re-emergence of Nuclear – the focus on Decarbonisation and low Carbon solutions are driving a renewed focus on R&D, IP creation, basic research and related future investments and growth strategies.

By 2030, India will be doubling its Electricity generation and tripling its Steel production and will have a strong semiconductor, energy storage and chemicals domestic manufacturing ecosystem alongside world-class Infrastructure. TCE is uniquely positioned given its capabilities in all these diverse domains (Infrastructure, Power Utilities, Nuclear, Chemicals, Mining & Metals, PMC and Digital). By leveraging these diverse capabilities and offering integrated solutions, TCE shall enable creation of sustainable infrastructure, smart factories, smart plants, smart cities, smart transportation and mobility solutions.

Value and Volume Driven Growth

As a consulting organisation, TCE faces the typical conundrum of addressing divergent customer needs. On one hand, the Company needs to maintain technological leadership and invest in creating high-end capabilities to serve complex and bespoke customer requirements, which require the involvement of highly experienced SMEs and flexible delivery approaches.

On the other hand, large-scale engineering engagements require TCE to offer capabilities at scale with efficiency, systemic delivery mechanisms and competitive pricing. TCE leverages its organisational experience, business model innovation and people expertise to address this dual challenge.

TCE has created dedicated teams of experienced SMEs across sectors and actively promotes the accumulation of intellectual capital, knowledge sharing and industry participation to emerge as one of the leading thought leaders in India today.

A relentless focus on delivering value engineering and a strategic focus on creating business in new areas has further enabled TCE to move in this direction and create ‘Value’ driven growth. TCE has also invested in creating robust engineering delivery systems, recruiting and training a young workforce and leveraging digital platforms to deliver projects at scale cost-effectively.

TCE’s Dedicated Engineering Center (DEC) approach to long-term customer engagements and focus on providing capabilities across the project lifecycle, including operations, has helped TCE become a consultant of choice for ‘Volume’ driven engagements from global customers.

TCE’s Vision is to be the leading player in shaping Sustainable Infrastructure and the NetZero journey by working with its customers, partnering with leading academic institutes and industry process and technology leaders and working closely with the policymakers. The Company will also leverage deeper collaboration with the Group Companies.

As the world discovers new solutions and technologies, TCE will focus on differentiated, benchmarked and value-engineered solutions for its customers to ensure their sustainability efforts and desired outcomes.

Aligned with its Vision, TCE continues to invest in its key assets – its PEOPLE – and will strive to provide a safe, happy learning environment. While being a 60-year-old consulting organisation has its benefits in terms of the experience and pedigree it brings, TCE visualises itself as a 60-year ‘young’ organisation with the vigour and vibrancy to fuel growth and prosperity for its stakeholders for the next century and beyond.

DIAMOND JUBILEE CELEBRATION



N Chandrasekaran, Chairman - Tata Sons



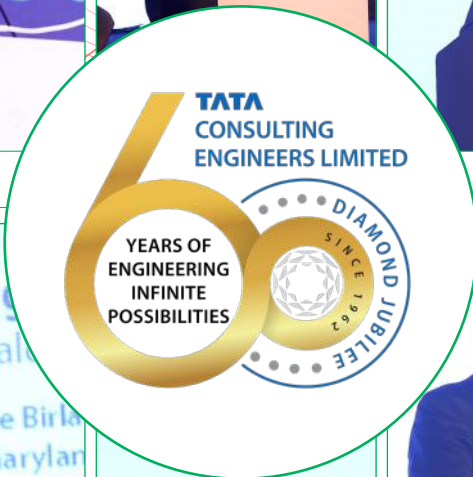
Dr Rajiv Kumar, Economist



Ashok Sethi, Chairman - TCE



Dr A Kakodkar, Nuclear Scientist



Dr Vijay Kumar Saraswat, Member Niti Aayog



Amit Sharma, MD & CEO - TCE



S Vidyand, COO - TCE



Mr Banmali Agrawala, President - Tata Sons



Prof Govindan Rangarajan, Director IISC - Bangalore



100 the Journey with Energy Transition, Nirbhar Bharat, role of partnerships



Prof Subhasis Chaudhuri, Director IIT - Bombay



FOSTERING FUTURE READINESS A TECHNOLOGY UPDATE

Technology leads to changes in every sphere of life. At Tata Consulting Engineers, it is no different. A dedicated team of technology experts with diverse and rich experience is tasked to study future technologies, assess the resulting changes, analyse how these impact TCE products and services and formulate/enhance its offerings to stay future-ready. The thrust is on providing innovative and value-added solutions to the industry. The increasing climate ambition of governments across the globe and the resulting net zero target setting by various companies has led to high demand for sustainable solutions. Based on the global energy transition mega trend, sustainability is essential in all design engineering services TCE provides across all industrial sectors.

580^{CR}
VALUE ADDITION
FOR CUSTOMERS

243
PRIDE ENTRIES

97
INNOVISTA ENTRIES

47
PAPERS/ARTICLES
PUBLISHED

70
SMEs ENROLLED ON
VARIOUS BIS COMMITTEES

08
NEW TECHNOLOGY
OFFERINGS

06
PATENTS
GRANTED

09
NEW TEMPLATISATION
SOLUTIONS

Apart from the policy support and incentives for the manufacturers, the new emerging technology solutions using greener and cleaner energy sources with alternate feedstocks and realignment of the existing technologies for reducing emission footprint pose a unique challenge in terms of selection of technology, finalising the implementation roadmap and assessing risks associated with respect to rapidly changing costs for the technology.

Hydrogen is the best example, forming a vital energy vector of industrial decarbonisation. At the same time, its technology costs, policies and regulatory framework are being developed simultaneously. Given such challenging conditions, TCE started an active collaboration with all stakeholders, such as policymakers, technology suppliers, original equipment manufacturers and academic institutes, to provide cost-effective and innovative solutions for the industry.

ENERGY TRANSITION FOOTPRINT

TCE is partnering with various stakeholders in the energy transition space by offering basic engineering, detailed engineering, procurement and execution support services. TCE is executing the world's first green ammonia commercial-scale project in the Middle East. The power requirement for the green ammonia plant is being catered to through solar energy and the water requirement for the hydrogen generation plant is met by seawater desalination. The key is to deliver an end-to-end solution in setting up a green ammonia unit. While executing the project, TCE developed several standard specifications related to safety, layout, etc. and was able to optimise the land space significantly.

TCE, a pioneer in energy transition supports its clients in technology selection studies and installation designs while setting up demonstration plants using various hydrogen generation technologies. TCE is also helping its clients develop the roadmap and phasing philosophies in their energy transition journey. TCE has developed a 1 MW modular, containerised hydrogen generation plant, ready to be taken up for production including material balance, flow diagrams, P&IDs, ordering specifications, bill of quantities, etc. The design is flexible enough to incorporate electrolyser OEM-specific requirements without any time delay. A similar offering for a 5 MW module is being developed.

Solar energy is an essential contributor in the energy transition journey, ancillaries like glass substrates for PV cells and Lithium-Ion batteries for energy storage requirements are also gaining traction. TCE is also offering services in setting up these plants in India, making it the only organisation to provide services in all aspects of the energy transition.

DECARBONISATION INITIATIVES

CO₂ emission is a significant concern for almost all industries. The decarbonisation roadmap for the sector is essentially built around using renewable energy and implementing technologies to minimise direct CO₂ emissions. Though the post-combustion CO₂ capture technology is proven and matured at a large industrial scale, utilising the captured CO₂ at scale or its conversion to other meaningful products would drive the decarbonisation roadmap for the industry.

Hard-to-Abate Sectors like Steel, Energy, Cement etc., use carbon as an integral part of their process and account for a significant portion of CO₂ emissions. These industries require redesign and retrofitting solutions as it is difficult to reach the carbon goals by ignoring them.

TCE's internal teams have simulated India's future energy mix basket to meet the net zero ambition providing insights for implementing decarbonisation strategies. Through thought leadership, TCE has laid down the decarbonisation pathways catering to various industries such as transportation, aviation, petrochemical and refineries and sustainable infrastructure, including hard-to-abate industries. Engineering solutions and technological pathways are also being developed to convert carbon dioxide to Synthesis gas (also known as syngas) which is a mixture of carbon monoxide (CO) and hydrogen (H₂).

TCE is also engaged with relevant stakeholders at a very early stage of project conception, working on the feasibility of using biomass, agricultural waste, Municipal Solid Waste (MSW) and carbon dioxide and converting it into Sustainable Aviation Fuel (SAF) and other products.

A dedicated team of technology experts with diverse and rich experience is tasked to study future technologies, assess the resulting changes, analyse how these impact TCE products and services and formulate/enhance its offerings to stay future-ready. The thrust is on providing innovative and value-added solutions to the industry.

RESEARCH & DEVELOPMENT THROUGH ACADEMIA COLLABORATION

In line with the Government of India's vision to promote indigenous technologies, TCE is associated with premier educational institutes, such as IIT Bombay and IISc Bangalore, promoting new technologies' development through research and development programs. The initiative is taken up through CSR funding and focuses on sustainable technologies. Highlights of some of the projects undertaken are as below:

REUSE OF CONSTRUCTION AND DEMOLITION WASTE



While it is an obvious challenge, TCE is working on using this waste to construct affordable and low-cost housing. This also supports the government's initiative of providing housing for all. TCE has collaborated with researchers at IIT Bombay on a program for developing low-cost housing solutions using 3D printing technology. A suitable raw mix composition of 100% recycled material for the printer is already established. Efforts are being made to scale up the technology and demonstrate the proof of concept that can be used to construct structures such as aanganwadi's, small houses, post offices etc., using recycled waste material with no fresh carbon content.

PRODUCING GREEN AMMONIA THROUGH BIOMASS



India is the third-largest ammonia consumer in the world. To be self-reliant and achieve net-zero emissions, indigenous technology for decarbonising ammonia is essential. A new pathway for economically producing green ammonia through biomass is being studied at IISc Bangalore in collaboration with TCE. This technology is based on the abundant availability of biomass in India, which will be used as a feedstock for making green and low-carbon ammonia. Biomass to hydrogen would be a carbon-neutral process.

EFFICIENT GREEN HYDROGEN GENERATION THROUGH WATER ELECTROLYSIS



The high cost of green hydrogen generation is one of the critical areas of concern for the industry. The ongoing worldwide research is expected to help reduce water electrolysis costs. TCE joined forces with IIT Mumbai and is developing a prototype for green hydrogen generation through water electrolysis using wastewater as feed. Developing an efficient, low-cost, water-based electrolyser would accelerate the green hydrogen technology deployment. The electrolyser shall use a new indigenously developed catalyst based on non-Nobel metals (Nickel Phosphide based) and will have efficiencies over 75%.

SOLID OXIDE ELECTROLYSER USING HIGH-TEMPERATURE STEAM FROM SOLAR HEAT



This emerging and economical method for green hydrogen production requires the least energy. The heat rejected by the electrolyser is a by-product. It is often used for regeneration or dismissed by the ambient air as running a secondary power generation or a cooling plant using this heat may not be economical. A research team of IISc Bangalore, in association with TCE, aims to recover this heat and utilise it to run a bottoming cycle with supercritical CO₂ as the working fluid.

KNOWLEDGE MANAGEMENT SYSTEMS

As a knowledge-driven consultancy, TCE ensures that the data and information are readily available across the organisation. With this objective, the Company has developed a robust digital knowledge management system that is continually updated to keep relevant. Leveraging TCE's presence in widely spread sectors, the knowledge management system helps cross-pollinate of ideas from one industry to another. Over the years, the knowledge management system has helped drive a mature value addition and innovation culture propelling operational excellence.

As a practice, value engineering workshops are conducted as a first step in project initiation as they can create maximum impact and absorb the changes without affecting project schedules. This practice has resulted in customer benefits and cost savings of INR 579 Crores in FY 2022-23.

The technology team regularly participates in various seminars, expos and symposiums to share their experiences during the execution of multiple projects based on first-hand experience

Such contributions include sharing learnings, challenges faced, highlighting requirements of statutory guidelines, policy interventions for smoother implementation and assistance of industries in decarbonisation initiatives in line with India's commitment to net neutrality. Experts from TCE participated and presented energy transition views at several national and international conferences. The knowledge gained by TCE teams is also shared through whitepapers on the role of green hydrogen in the decarbonising hard-to-abate industry, such as steel and fertilisers. Seventy senior domain experts are on the Bureau of Indian Standards (BIS) committees that create uniform engineering standards.

ASK EXPERT

Quick Resolution to Technical Queries

PROBLEMS WORTH SOLVING

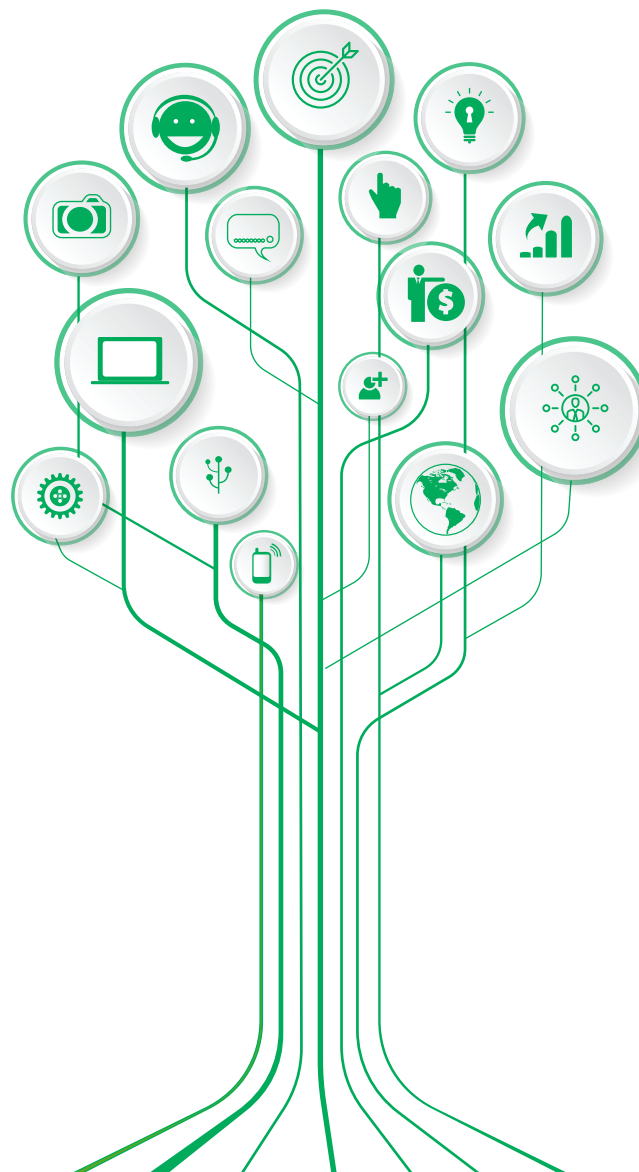
Crowd sourcing platform to solve problems

VALUE ADDITIONS & INNOVATIONS

Portal to capture and share new learnings

BOOKS, PERIODICALS AND STANDARDS

Quick and easy access to codes of practice



PROJECT DOCUMENTS REPOSITORY

WRENCH

PROJECT LEARNINGS

Lessons learnt & job completion reports

UPGRADED DOCUMENT MANAGEMENT SYSTEM

Standard documents search engine

DESIGN SUITE

Anytime Anywhere access for calculation routines

BUILDING INNOVATION CULTURE

Innovation only sometimes means invention. As an engineering consultancy, TCE provides simplified, optimised, low cost and easy-to-implement designs for most complex problems encountered during the execution of challenging projects, building TCE’s innovation culture.

Project Innovation in Design Engineering or PRIDE is the internal platform and competition to promote the innovation culture and share the innovative solutions provided during project execution. It demonstrates TCE’s capability to provide value-added, differentiated services to its customers. This year close to 250 actual project cases of problem-solving was presented.

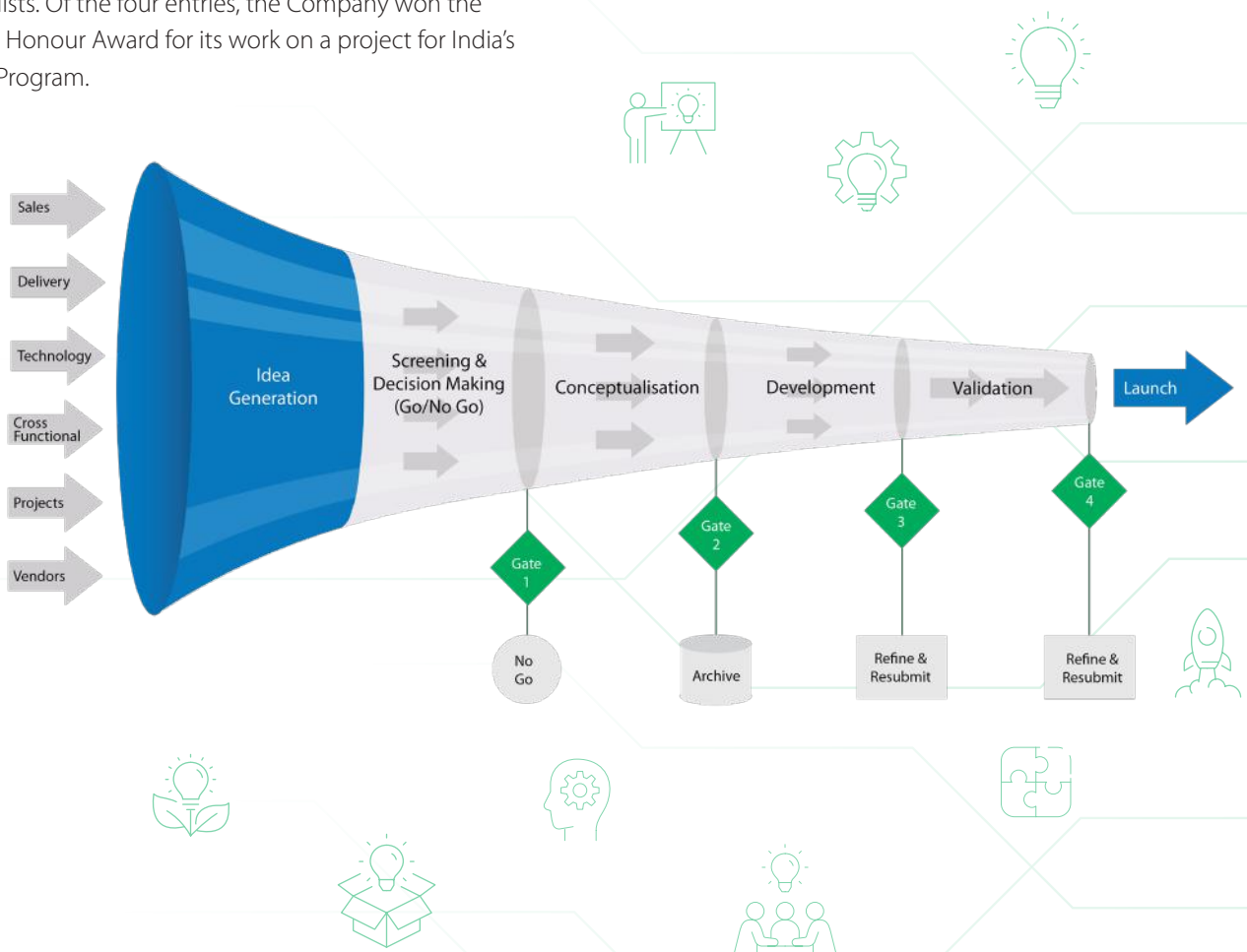
Innovista is another flagship platform for Tata Group companies to showcase project/process innovations. Amongst 10000+ entries that the competition receives every year, four projects of TCE made it to the list of 56 finalists. Of the four entries, the Company won the Design Honour Award for its work on a project for India’s Space Program.

Employees are encouraged to participate in Tata Hackathons, a crowdsourcing platform of the Tata Group. The collective efforts have resulted in 14 patent applications, granting six patents to TCE.

To prepare the organisation for the future, the technology team at TCE continues developing innovative and sustainable solutions for the customers.

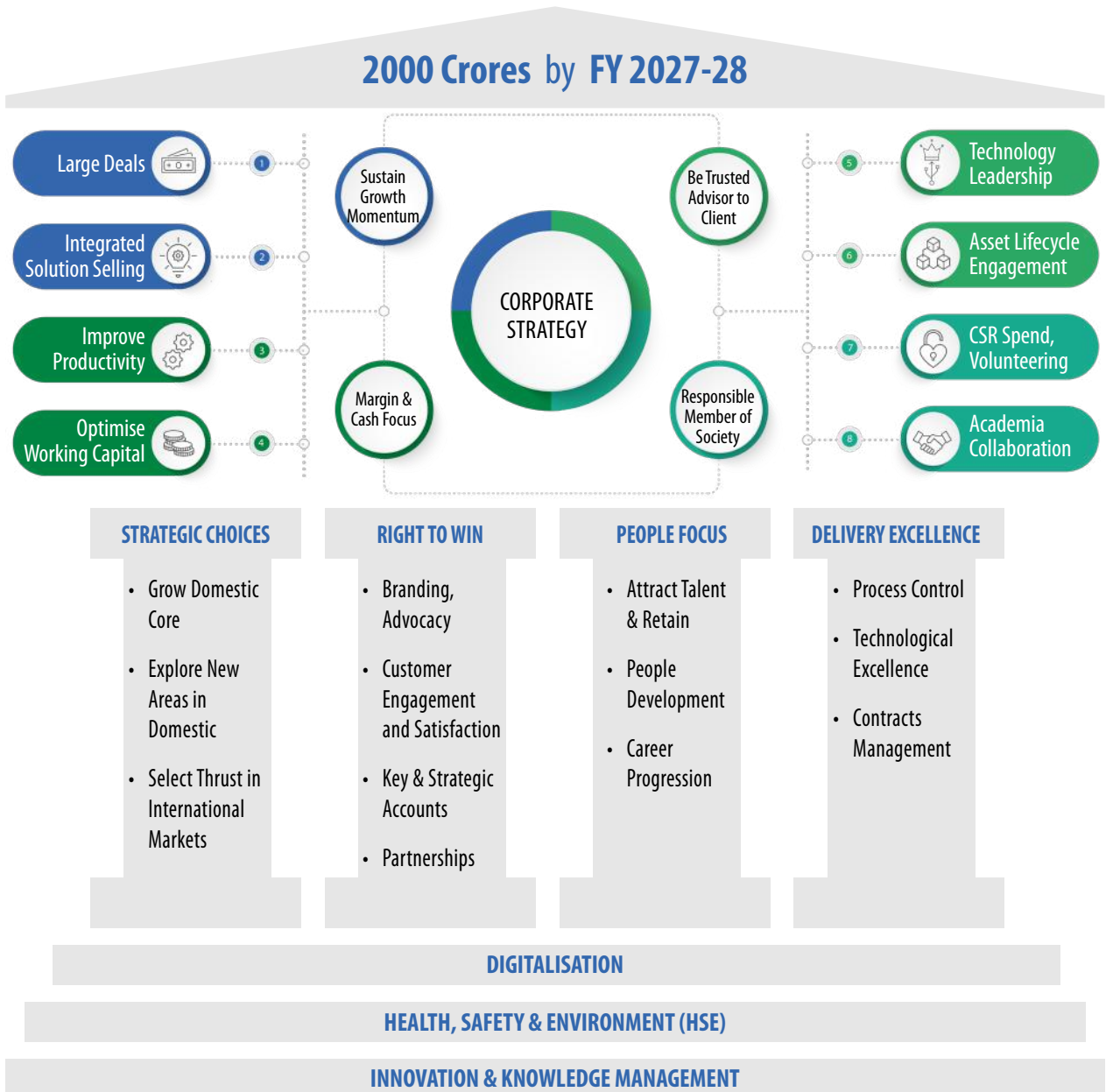
While the industrial energy transition and decarbonisation are the focus areas for the near future, effective collaboration and partnerships with industry, academia, OEMs, etc., ensure TCE is well-poised to take on a leadership position in this space.

Several first-of-its-kind projects on new emerging technologies would continue and the technology team would strive to ensure TCE continues to achieve technical excellence in the future as well.



STRATEGIC FRAMEWORK

TCE continues to be guided by its vision of becoming an “Internationally Respected Consulting Firm” and strives to create unparalleled value for all stakeholders. TCE’s strategy framework and processes are a rudder to steer the organisation in the ever-evolving landscape of geo-political and technological developments. TCE’s long-term target is to achieve an annual turnover of more than INR 2000 Crores through organic growth and become India’s largest engineering consulting firm. The challenge ahead is to achieve the twin peak of scale (volume) and intellectual leadership (value). TCE aims to achieve the same through a combination of focused corporate and business-specific strategies while continuing to enhance organisational resilience by investing in innovation, knowledge management and digitalisation.



VALUE CREATION MODEL



TCE constantly endeavours to deliver customer aspirations and ensure customer satisfaction. Providing best-in-class solutions using the latest technology and value engineering ensures timely delivery and helps save costs for the customer, thus making TCE a partner of choice. Creating value for all the Stakeholders and taking actions aligned with the Company's strategic focus areas helps it create sustainable long-term value.

OUTCOMES

- Total Consolidated Income of Rs 1137 Crores; New Order Acquisition at Rs 1586 Crores
- 38% of business from international markets
- 19% of business from Opex Services
- Prestigious projects bagged include 2 x 700 MW PHWR Units 5 & 6 at Kaiga in Karnataka, Lithium Battery Manufacturing Plant at Chennai, VCM – PVC Plant – Detailed Engineering for a Japanese Major, Smart Cities in Gujarat and Madhya Pradesh,
- TCE continues to work on marquee projects such as ITER, High-Speed Rail and Ayodhya Temples in FY 2022-23

Customers

- 11.6% of business orders through cross-selling and offering Integrated Solutions
- 19% acquisition from Large deals
- 41% Revenues from Key/ Strategic Accounts
- Customer feedback index at 71.25 (target 70)

Responsible Member of Society

- 28165 Students benefitted from various targeted Education Initiatives
- Total CSR investments were at Rs 281 lakhs
- Corporate volunteering clocked 15616 hours

Learning/People

- Focus was on reskilling and training. All-round training was at 30+ person-days per employee. While overall attrition is a challenge, Attrition of key talent was curtailed at 8.3%.
- Safety was a key focus on site and in offices. The safety index was 4.07 at sites.

Processes

- Processes were strengthened through several automation applications for technology (knowledge management), people process, sales & operations, streamlined deliveries and improved sales process.. A strong focus on innovation across the organisation led TCE to secure the prestigious 'Tata Innovista Award'.

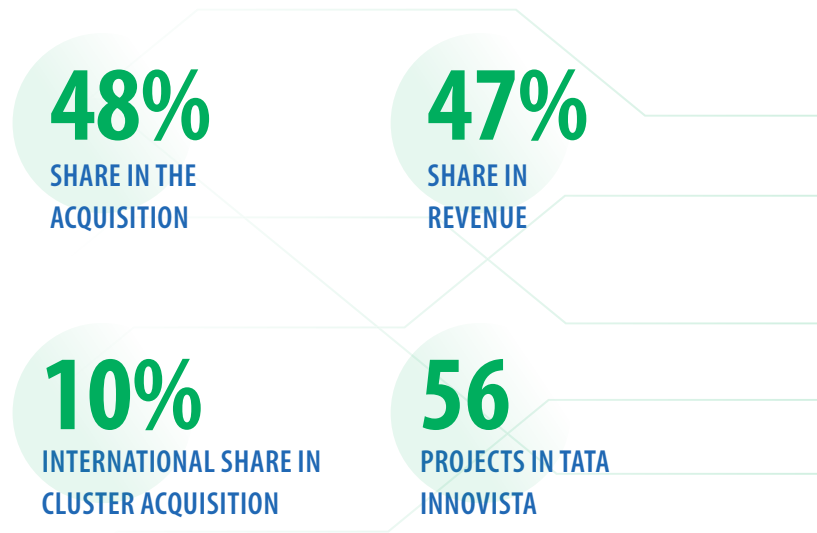
INFRASTRUCTURE CLUSTER





INFRASTRUCTURE
PROJECT MANAGEMENT
ECOFIRST

INFRASTRUCTURE CLUSTER OUTLOOK






INDUSTRY OUTLOOK

Infrastructure development is analogous to the growth of society, nation and people. It provides services that allow society to function and economies to develop, from transportation to electricity generation to water supply and hygiene networks. Infrastructure is thus placed at the centre of efforts to achieve the Sustainable Development Goals (SDGs). To realise sustainability in infrastructure, it is essential to take a holistic approach that considers the entire life cycle of infrastructure, from planning and design to construction, operation and maintenance. This requires collaboration between multiple stakeholders, including government agencies, private sector partners and local communities, led by a significant ability to accomplish the three spheres of the SDGs, i.e., economic, environmental and social sustainability.

India is a rapidly developing country with a growing demand for infrastructure and an increased focus on sustainability. The Indian government has taken various initiatives to promote sustainable infrastructure, such as the Net Zero Commitment, Namami Gange Mission, Jal Jivan Mission, Pradhan Mantri Awas Yojana, Prime Minister Gati Shakti Mission, National Smart Cities Mission and the Sustainable Urban Transport Project. Infrastructure Cluster proudly partners with the Government and Private establishments to achieve India’s policy vision and its commitment to inclusive and sustainable development at a global level.

The three business units under the infrastructure cluster, viz. Infrastructure, Project Management and Ecofirst spearhead various facets of green infrastructure.

INFRASTRUCTURE 	PROJECT MANAGEMENT 	ECOFIRST 
<ul style="list-style-type: none"> • Water, Wastewater & Sewage • Buildings & Facilities • Environment & Sustainable Infrastructure • Industrial & Manufacturing Facilities • Master Planning & Urban Development • Ports & Transportation 	<ul style="list-style-type: none"> • Project Management • Engineering & Constructability Review • Construction Management / Supervision • Program Management • Interface Management • Quality & Safety Audits • Outage & Opex Management • Procurement Management 	<ul style="list-style-type: none"> • Sustainable Integrated Design of Buildings • Urban Design • Sustainable Engineereconomics • Climate and Sustainability Services • Program Management • Digital & Modelling

The businesses proactively promote sustainable materials and construction practices on projects, urban planning to manage stormwater and greywater systems, reducing the urban heat island effect and improving air quality. The concept expands to the Transportation sector by developing smart transportation solutions such as electric buses, car-sharing and intelligent traffic management systems aiming to reduce emissions. Ecofirst is contributing to projects of Zero carbon, Net zero discharge, ESG support, climate change impact assessment, sustainability for the built environment etc.

One of the significant challenges for sustainability in infrastructure development in India is balancing economic growth with environmental protection. The country's large population and high energy demand have led to an increased focus on renewable energy sources such as solar and wind power. The government has set a target of achieving 175 GW of renewable energy capacity by 2022, which includes 100 GW of solar power. Policies like FAME and National Green Hydrogen Mission are changing the face of manufacturing and infrastructure sectors in India.

The Infrastructure Cluster, in collaboration with Plant & Engineering Cluster, has significantly contributed to the sustainable development of Infrastructure and key Sustainable solutions in India and globally. The Cluster focuses on green buildings, smart urban transportation solutions, waste management and water management solutions.

The Cluster promotes several Indian government initiatives of sustainable building practices, such as the Energy Conservation Building Code and the Green Rating for Integrated Habitat Assessment (GRIHA), across Projects. The team also partners policies and leading projects that contribute to achieving the global vision of developing Sustainable Infrastructure through planning of urban spaces, contributing to sustainable designs and codal provisions, enhancing and implementing innovations in sustainable materials and construction practices, etc. and creating a better tomorrow in Infrastructure that balances economic growth, social development and environmental protection.



INFRASTRUCTURE BUSINESS REVIEW

The infrastructure business unit of Tata Consulting Engineers (TCE) is engaged in a sector that propels the overall growth of any economy. This sector also enjoys immense support from the government of India, with various policies being announced to enable the country's time-bound development of world-class infrastructure. To ensure sustainable development, India has suggested an investment of Rs. 5,000,000 crores (US\$750 billion) for railway infrastructure between 2018 to 2030.

Infrastructure Business (IBU) provides sustainable solutions in the field of Green infrastructure for Transport, Social infrastructure, Water supply & Sanitation, Industrial wastewater treatment, Smart city development projects, Waste management, Waste to Energy (WtE), Ecology and Biodiversity studies, Green belt and Green area development projects, Special Economic Zone (SEZ) for agriculture, Riverfront development, Lake Rejuvenation & Watershed Development



KEY TRENDS SHAPING THE INDUSTRY

- With the Government announcing a significant boost for infrastructure spending in its budget for the financial year 2023-2024, sectors like railways, roads, power stations, telecommunications networks, water supply and affordable housing will likely attract substantial capital investments.
- Since the impact of climate change is becoming a global issue, significant investment in research into cleaner fuels, carbon abatement, energy efficiency, green hydrogen, green infrastructure and innovations in other green technologies is expected.
- Use of digital interventions like IOT, AI, predictive maintenance, digital dashboards etc., will see adaptation at a large scale for driving long-term efficiency and performance from infrastructure assets.
- While the road and railway infrastructure will remain the focus of infrastructure spending, the sectors like ports, airports, water and sanitation, mass housing and industrial infrastructure are expected to receive massive investments.

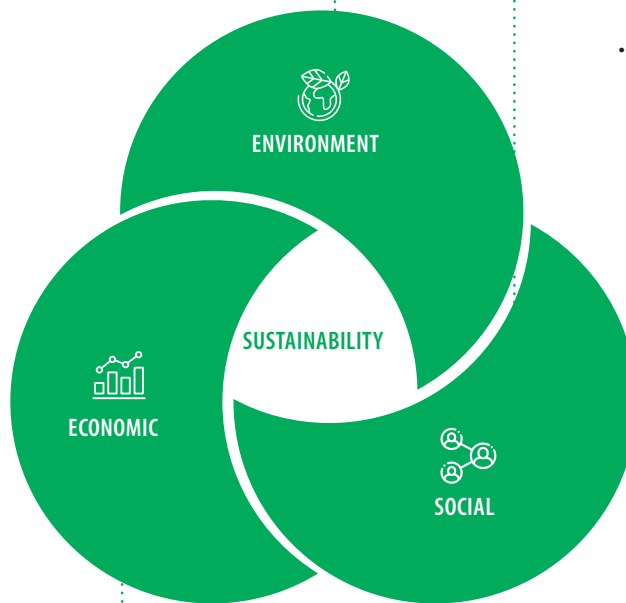
- Comprehensive industrial development under National Industrial Corridors will open opportunities to leverage multimodal transport and other enabling infrastructure.
- Continued upward swing in rapid urbanisation shall increase the demand for sustainable infrastructure and innovation in construction methods.
- Transportation is likely to remain the fastest-growing area of India's infrastructure sector. Demand for well-developed roads and highways, a widespread railway network, high-speed rail, metros, aviation, ports, shipping and inland waterways infrastructure is rising.
- With a focus on integrated planning and coordinated implementation of infrastructure connectivity projects, Digital technology, including GIS, will form the backbone of Gati Shakti.
- The trend seen in increased spend on the development of healthcare infrastructure in the previous year is expected to continue for a while.
- Global chip shortage will result in significant investments in developing semiconductor manufacturing plants in India.
- Manufacturing infrastructure in defence, electric vehicles and batteries also looks promising.

KEY AREAS OF EXPERTISE:

The infrastructure vertical of TCE delivers holistic Sustainable Development Solutions focusing on three key elements, Economic Growth, Social Inclusion and Environmental Protection.

KEY ASPECTS

- Prevents nature from being used as an inexhaustible source of resources.
- Aspects such as environmental conservation, investment in renewable energy, saving water, supporting sustainable mobility and innovation in sustainable construction and architecture, contribute to achieving environmental sustainability on several fronts.



KEY ASPECTS

- It can foster gender equality, development of people, communities and cultures to help achieve a reasonable and fairly-distributed quality of life, healthcare and education across the Globe

KEY ASPECTS

- Focuses on equal economic growth that generates wealth for all, without harming the environment.
- Eradicating poverty in all its forms and dimensions.
- Integration of Scientific and Traditional knowledge

WATER & ENVIRONMENT

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

BUILT ENVIRONMENT:

- Building sustainable cities with complete infrastructure planning, design and commissioning offerings
- Providing engineering solutions for large-capacity industrial units and manufacturing facilities
- Leveraging the 3D platform for the Engineering Modelling 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 cities and large SEZ spaces.

KEY ACHIEVEMENTS



TCE's innovative approach and value engineering saved millions of litres of water by smart metering and distribution system, re-use and recycling of wastewater, Rejuvenation of several lakes and water bodies etc.



TCE's approach to sustainable practices has helped industries, Institutions and Government organisations meet their sustainable goals.



TCE carried out Detail Project Reports (DPRs) for more than 100 Urban Local Bodies (ULBs) for Solid Waste Management (SWM) to meet the Swachh Bharat Mission (SBM) guidelines and benchmark.



TCE worked on several WtE projects in India and internationally, resulting in tons of waste being utilised for generating electricity.

KEY INITIATIVES THAT HELPED PROVIDE BENCHMARK RESULTS

Challenges like water, wastewater and waste management for high altitude areas, harsh climate issues for agriculture, connectivity issues, lack of digital education facilities and lack of social infrastructure can be addressed with sustainable, innovative solutions.

Keeping in line with changing times, the TCE Infrastructure team focussed on creating sustainable, innovative solutions comprising smart waste management, smart parking, smart lighting, smart meters & management for water and energy, waste to energy & fuel, Intelligent transport facilities, reuse of wastewater, rainwater harvesting etc.



A PROJECT

INTEGRATED DEVELOPMENT & REJUVENATION OF CHAB TALAB IN DAHOD CITY

Rapid Urbanisation of Dahod city has led to unplanned growth and deterioration of open and community spaces around Chab Talab. Very few open spaces or green areas like lakes, gardens, playgrounds, etc., exist within Dahod City and Chab Talab. A few of them are in good condition but in dire need of maintenance, whereas other open spaces around Chhab Talab needed to be redeveloped entirely.

Lake Preservation and Rejuvenation, Preservation of Flora and Fauna, Converting an unutilised space into an active community Public Space and inclusion of Recreational activities were the main objectives of this project.

The significant strategies used for Chab Talab development include foreshore development with jogging/walking track and cycle track, development of activities for all age groups, development of health-related facilities for Yoga, Aerobics, open gyming, sports etc., development of recreational activities like boating, amphitheatre, diversion of sewage from surrounding residential areas into proposed decentralised wastewater recycling plants for lake recharging and urban landscaping, improving safety concerns for proper utilisation of the Talab, creation of thematic gardens, lawns and trees to increase the area's green cover substantially.

The project components include a Yoga/Meditation Area, a Children's Play area with Equipment, a Sand Pit, a Designated area for outdoor exercise with Open Gyms, the Creation of tree parks and Theme Gardens, Walkways/Jogging tracks and Cycle tracks, Decentralised Wastewater Recycling Plants, Amphitheatre, 2 Food Kiosks and food court areas, Hedge Maze, Water ATM/Dispenser, E-Toilets/Public Toilets, Restoration of existing gardens, public spaces and the pond itself.





**A PROJECT
A LARGE MANUFACTURING PROJECT IN MAHARASHTRA**

The client proposed to expand its product manufacturing facilities in Maharashtra in two phases. Phase-1 consisted of 5 manufacturing plants, Utility Building, an ERC building and Infra-Utility Facilities. The campus was designed for a Platinum rating under IGBC Green Factories.

TCE provided the Detail Design Services to develop this state-of-the-art manufacturing facility. Sustainability measures for the campus included:

- Reduction in heat island effect achieved by selecting a roof with an SRI value of more than 78.
- Rainwater Harvesting Capacity of 60,000 cum water storage body under considered
- 20% lawns were reduced. 40% plants were replaced with drought-tolerant species.
- No up lighters & LED lights used for external lighting to reduce night sky pollution.
- Electrical Charging points provided for 5% of parking space.

IMPACT

- Saved 50% in material cost using locally available materials from within 500 km.

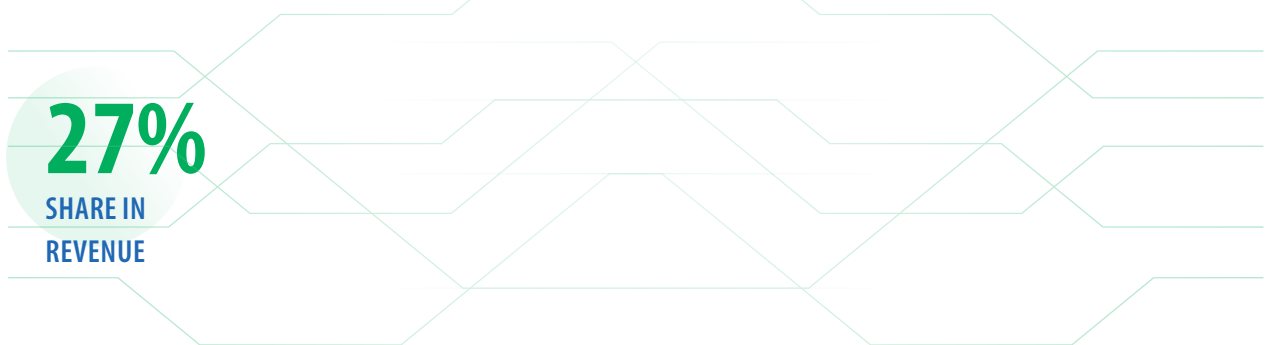


PROJECT MANAGEMENT BUSINESS REVIEW

The Project Management Consultancy (PMC) Service is famed for its dedicated project management capabilities and established systems, procedures and usage of digital tools. The offerings span project management, commissioning support, engineering programme management and planning and quality, inspection and expediting. The Tata value system helps ensure high Ethical practices and International standards in safety and quality.

The PMC business enables its clients' decarbonisation journey by reducing the carbon footprint through recommendations of Green Construction methodologies, using new technology, recycling material and reducing rework and labour. The PMC teams stringently monitor various Green Building norms about building materials, energy efficiency during construction and operation, the use of renewable energy systems and water conservation technologies.

From the simplest projects to the most complex such as extensive nuclear energy facilities, PMCBU has proved its might as the country's top-notch PMC service provider.



KEY TRENDS SHAPING THE INDUSTRY

- As per the World Green Building Council, the Building & Construction industry is responsible for nearly 39% of the world's carbon emissions, i.e., roughly 9 billion tons per year.
- The Paris Agreement laid out a target of reduction of energy intensity for buildings by 30% per square meter by 2030 and Net Zero carbon in the construction industry by 2050.
- A visible industry shift towards greener construction methods like prefabrication, modularisation and 3D Printing eliminates the need to build structures on-site from scratch. Various elements can be manufactured separately and combined with customisation options, resulting in a 30% lower carbon footprint.
- Implementing digital technology, like BIM and smart sensors, enhances the efficiency of Building Design, Construction Processes and Resource Management while reducing environmental impact by 50% or more. In fact, on account of this usage alone, the value of the BIM market is set to exceed \$10.7 billion by 2026.
- The Circular Economy Approach focuses on reusing and recycling materials instead of sending them to landfills and has substantial potential to decrease waste and enhance resource efficiency. Focusing on this alone will create a significant impact on the industry.

KEY AREAS OF EXPERTISE

- **Precast construction** in Mass Housing Schemes and Viaducts.
- **Implementation know-how of technologies** like BIM, App based working platforms etc.
- **Sustainable solutions** in Building Civil & MEP works



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.

KEY INITIATIVES THAT HELPED PROVIDE BENCHMARK RESULTS

- Digital & Advanced Technology initiatives like SmartSITE and WRENCH for Document Management helped reduce paper. Drones & Robotics and other automation-enhanced Construction techniques, support supervision and associated PM deliverables.
- Continuous Process Improvements and implementation of new technologies, new guidelines and updated procedures at all levels of operation in PMC
- As Digital and Advanced Technology leaders, using 4D and 5D expertise ensured projects ran error-free, on schedule and with minimum wastage.
- Safety is paramount to TCE and with a keen focus on this aspect, the Company has ensured millions of safe working hours on all its projects
- Training the entire team on sustainability and construction techniques



A PROJECT SHRI RAM MANDIR, AYODHYA

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 temple structure is being constructed using a traditional stone structure made up of sandstone with a Design life of 1000 years and zero/minimal use of cement & reinforcement that do not have a validated longevity history. 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.

The unique value additions by TCE are highlighted below:

- The original design had Pile foundations with 1000+ no. of piles of varying length and PCC piles without any reinforcement with limited lateral load-carrying capacity. This design was revised and the complete excavation was replaced with high-quality engineered fill and Roller compacted concrete of compressive strength.

- Most superstructure elements (Columns, pillars, walls, beams, slabs, mandaps) are being constructed using Bansi Paharpur sandstone embedded with Copper Pins and clamps and the clamp's male-female joints are set within the stone elements.



A PROJECT

PRE-CAST CONSTRUCTION: A LARGE MASS HOUSING PROJECT IN MAHARASHTRA

Precast technology improves a building's stability while lowering construction costs by 10 to 15%. This technology can help close the gap between production and consumption, as components are prefabricated and brought to the site for assembly.

Tata Consulting Engineers is the Project Management Consultant for this large mass housing project which achieved the following results:

- **Mission 96:** One Stilt+12 storey tower with 96 flats handed over to the client in 96 days with all architectural and MEP finishing.
- 3-day floor cycle set a new global benchmark for RCC Residential construction (Industry norm: 8 to 12 days per floor).
- RCC overhead tanks converted to total Precast tanks for the first time. All 4 tanks were ready in 7 days after the slab was poured; the entire terrace work was completed in 10 days.

This technology supports enormous reduction in water consumption, extensive recycling of material and water and reduced time, labour and energy, leading to reduced carbon footprint and almost NIL construction debris. Offsite construction aids better quality leading to lesser rework and repairs while avoiding masonry and plaster wet works.

IMPACT

- Fast-paced project delivery, almost 100+ slabs casting completed nearly every month of the Project



ECOFIRST BUSINESS REVIEW

Ecofirst, a 100% subsidiary of Tata Consulting Engineers Limited, is a Sustainable Design Consulting firm for the built environment. The Company provides an array of integrated services for Master Planning, Water, Energy, Solid Waste, Infrastructure and MEP (Building Engineering) Design. Ecofirst strives to provide innovative and cost-effective solutions focusing on resource conservation. Additionally, the Company offers solutions to reduce operation and maintenance costs through sustainable energy and water management strategies. The Company specialises in sustainable and responsible development solutions by seamlessly integrating Architecture, Engineering & Environment.

51%

GROWTH IN TOTAL
REVENUE YOY

20%

CAGR OVER
5 YEARS

115+

HEADCOUNT

700+

PROJECTS
EXECUTED

KEY TRENDS SHAPING THE INDUSTRY

- Increased use of Digital Technologies: Design and construction companies today utilise the power of digital technologies helping in reducing costs and increasing productivity.
- Increased recognition for integrated services: Customers today are looking for sustainable solution providers who can cater to the entire spectrum of services from design to execution. The integrated design ensures seamlessness of working and efficient tracking of deliverables.
- Increasing awareness for sustainability, ESG, climate change impact and Net zero: Building construction and operations account for nearly 40% of global energy-related CO₂ emissions. However, growing awareness around sustainability is propelling customers to demand eco-friendly options that help reduce the carbon footprint and waste.

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KEY AREAS OF EXPERTISE

Driven by its mission of creating sustainable communities by developing and delivering region-specific solutions, the Company provides various customised solutions for its project while incorporating learnings from one project to another, making it a leading sustainability consultant in the industry.

Climate and Sustainability Services

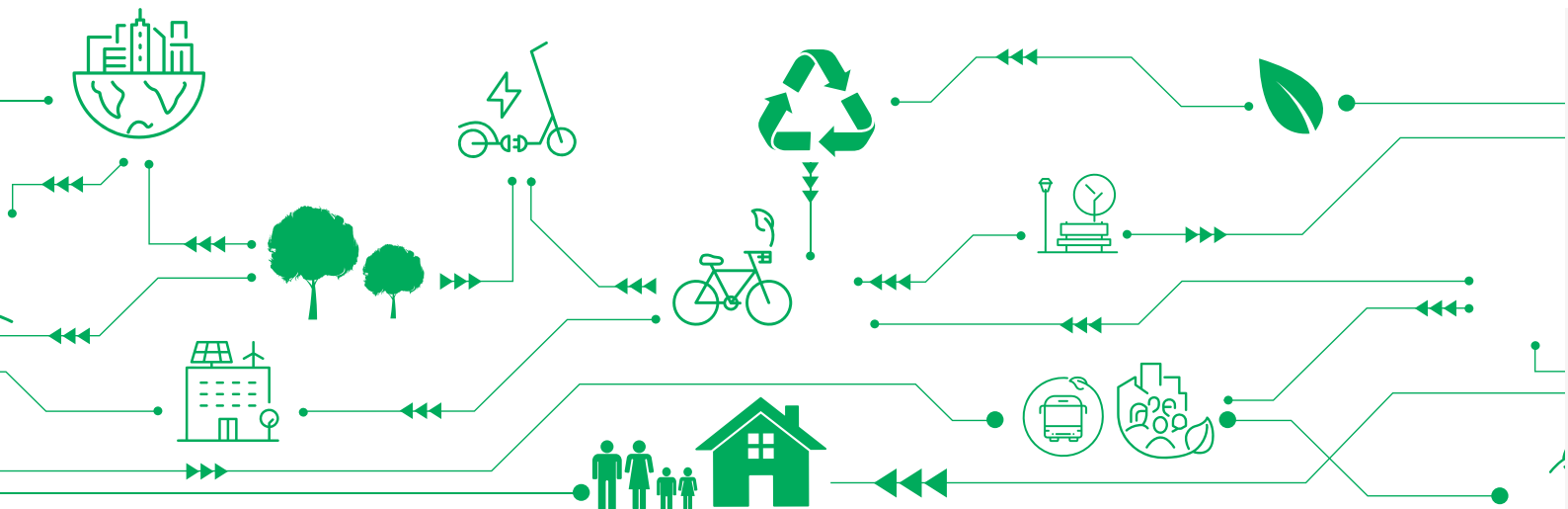
- Zero Carbon Development
- Climate Change Vulnerability Assessment, Flood Modelling
- Life Cycle Assessment
- SDG implementation handholding
- Design Enhancement
- Sustainability Audits
- Green Building certification
- Energy & Light simulations
- Sustainability Monitoring (Post Occupancy Evaluation)
- Testing & Commissioning

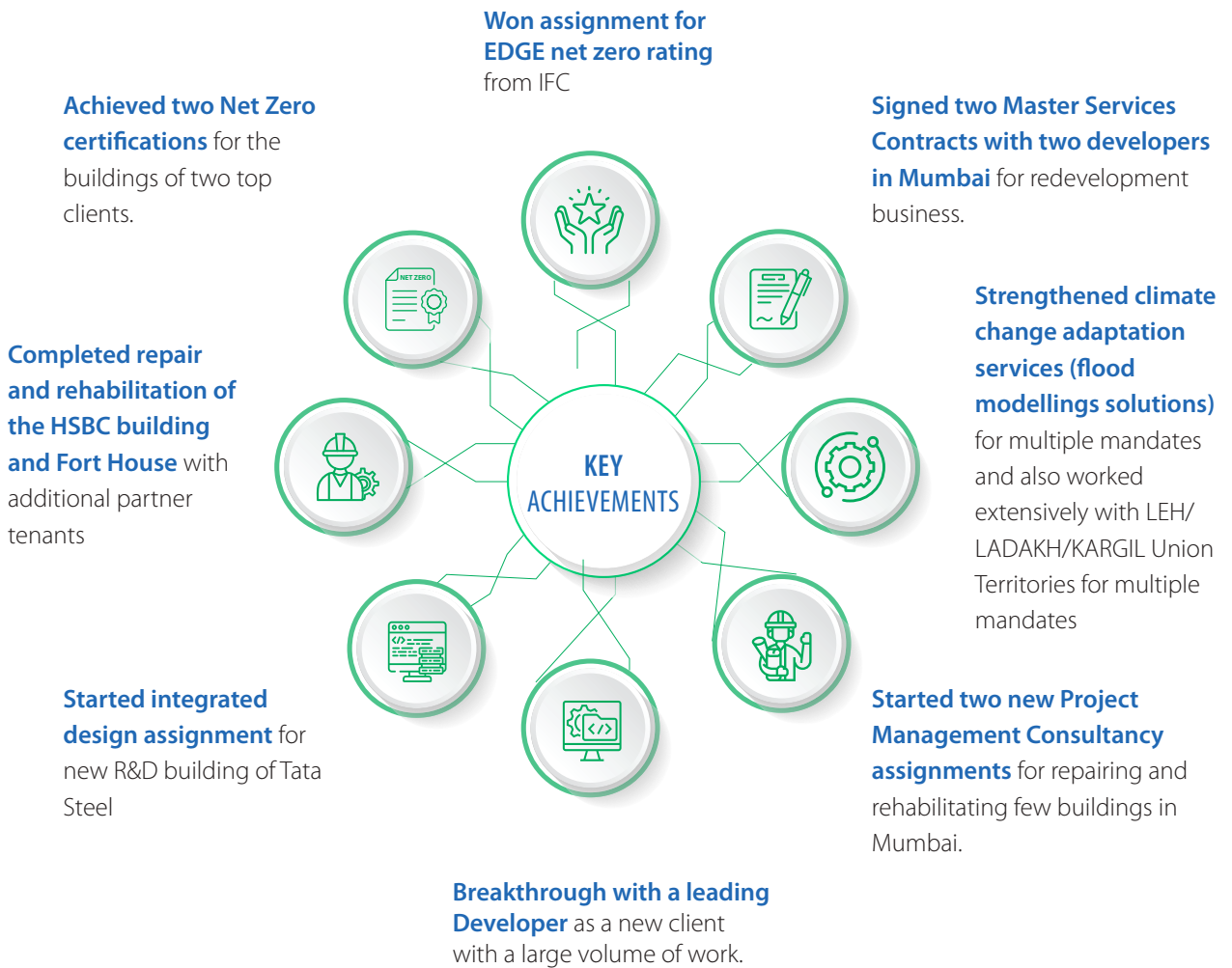
Sustainable Integrated Design of Buildings

- Master Planning
- Architecture
- Landscape Design
- Façade Design
- Structure Designs
- Building Engineering (MEP)
- Land Development and Wet Infrastructure
- BIM 7D/Digital Twin
- Vertical Transport and crowd mobility

Program Management

- Self – Redevelopment Programs
- Heritage Buildings
- Special Buildings
- Repair and rehabilitation of buildings





KEY INITIATIVES THAT HELPED PROVIDE BENCHMARK RESULTS

- Push for comprehensive services delivery solutions gained traction with customers leading to multiple assignments.
- Initiative for Climate change risk assessment (flood modelling) helped create market credentials and recognition.
- The excellent delivery of several rehabilitation projects helped Ecofirst gain recognition for repairing and rehabilitating old buildings, especially in the South Mumbai market leading to multiple opportunities.



A PROJECT
OPERATIONAL NET ZERO ENERGY FOR HINDUSTAN UNILEVER RESEARCH CENTRE

Hindustan Unilever Research Centre (HURC) in Bangalore has been recently awarded as a Near Net Zero Energy Building—India’s 1st Operational R&D Net Zero Energy Building for 3.5 Lakh sqft. Ecofirst was appointed as the consultant to facilitate this net Zero transition. Ecofirst participated in this journey for more than three years with the HURC team by tracking consumption trends. The overall energy efficiency of the project was assessed by developing a detailed energy model and comparing the same with ECBC 2017 baseline.

The scope of services included Sustainability Retrofits Planning for Opex, Onsite PV Design Strategy, Off-Site Renewable PPA Strategy, Day Light Simulation and Energy Modelling and Certifications - IGBC Existing Building, IGBC Green Campus, IGBC Net Zero Energy Certification.

The project was completed in October 2022 and has an onsite solar PV installation of 392 kWp, which generates Green Power through a PPA agreement explicitly signed for this project. Currently, HURC offsets 82% of the consumption through Renewable Energy Sources (onsite and offsite). The project plans to ramp up offsite RE consumption the following year by adding more green power and evaluating energy conservation measures on the site.

Additionally, HURC is now working towards compliance with Net Zero Water and Waste measures while eventually preparing to target Net Zero Carbon Goals.

KEY CHALLENGES:



- Offsetting Grid Consumption through offsite renewable energy was a challenge. The client had to regularly assess the monthly consumption and develop the offset strategy suitably. They budgeted the additional cleantech investment and got the approvals for implementation.
- Limited floor space on the roof, limited the on-site RE increase potential.

IMPACT

- This certification gives the project international recognition for balancing the overall energy consumption and offset.
- It paves the way for existing projects of similar categories to assess energy conservation and eventually graduates to near-net zero energy buildings.



A PROJECT
MAHINDRA LIFESPACES (EDEN, BANGALORE)

MLDL Eden at Bangalore has been recently awarded as a Designed for Net Zero Energy Building. The project has an onsite solar PV installation and a Wind Turbine installation which helps offset the annual energy consumption by 5% through onsite renewable energy. The project developer is talking with DISCOM to permit wheeling Green Power through offsite generation sources.

The project developer encourages the OM to provide 95% of the remaining energy through clean generation sources. It is **India's 1st Multi-Family IGBC Pre-certified Net Zero Energy Homes + Platinum Pre Certified IGBC Green Homes (Residential Development for 1 Million + Square Feet Area).**

Ecofirst has participated in this journey with the MLDL team for over two years. This being a design project allowed Ecofirst to engage with the architects at the design board level and liaise with the technical teams to detail the systems and their efficiencies.

The overall energy efficiency of the project was assessed by developing a detailed energy model and comparing the same with ECBC 2017 baseline.

The scope of services included Sustainability Integration in Master Planning, IGBC Green Homes Certification, IGBC Net Zero Energy Certification, Day Light Simulation and Energy Modelling.

SUSTAINABLE LIVING



ENERGY
Maximise renewable energy source



WASTE
Advanced waste diversion



WATER
Partial dependency on external source of water



BIODIVERSITY
Save existing trees and plantation of trees removed

KEY CHALLENGES:

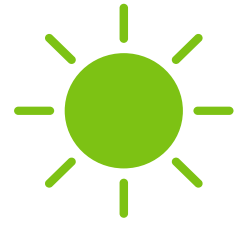
- Engaging with DISCOM to agree to wheel in renewable energy through offsite generation sources
- Ensuring that the ideas get converted from the drawing board to the execution

IMPACT

- This is the first Net Zero Residential Project in India and inspires other projects in a similar category to think of pursuing the direction.
- This has empowered all the technical consultants' synergistic thinking and working.

PLANT ENGINEERING AND DESIGN (PED) CLUSTER



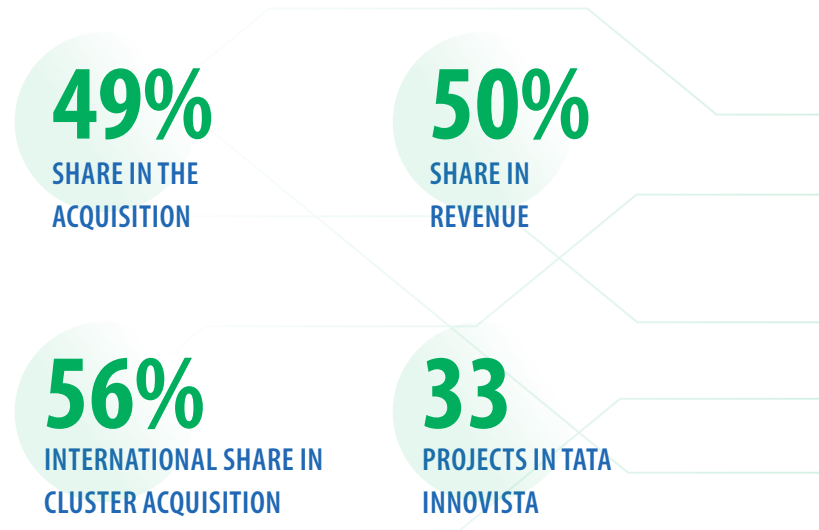


POWER

RESOURCES - HYDROCARBONS & CHEMICALS

RESOURCES - MINING & METALLURGY

PLANT ENGINEERING AND DESIGN (PED) CLUSTER OUTLOOK



INDUSTRY OUTLOOK

The focus on Energy Transition is getting reinforced – while the emphasis was on Renewable Electricity Generation in the last decade – this decade is seeing a visible shift towards Hydrogen Derivatives and Industrial Decarbonisation.

By 2030, 2/3 of India's projected 800 GW installed capacity will be green. From the perspective of total energy across all sectors, this would be 13%, taking India a step forward towards its goal of Net Zero by 2070. The overall Energy use is expected to grow by 35%.

The recently announced National Hydrogen Mission (NHM) intends to capture 10% of 100 MMTPA of Green Hydrogen demand that is expected by 2030. NHM focuses on 5 MMTPA domestic GH₂ production and indigenous production of electrolyzers and batteries and biomass-based GH₂. Globally Electrolyser production in the last 2-3 years was about 2~4 GW and is expected to grow to 200 GW by 2030.

The first industrial uptake planned is Green Fertiliser. This will involve the award of projects and construction in FY 2023-24, with production slated from FY 2025-26. In this phase till 2026, pilot projects are planned in the steel and shipping industry. In the next four years, i.e., till 2030, the focus shifts to commercial scale projects in steel, shipping and mobility and railways and aviation sectors.

The focus in the first phase till 2026 is also on the creation of policies that will aid production and uptake – such as RE waivers inter-state for GH₂ production, RE banking; Time-bound open access and connectivity; Integrated planning for RE, T&D and GH₂ manufacturing; availability of land and SEZs; Green Finance; Green Bonds etc.

Globally, the Middle East and Africa appear to be the regions in which maximum activity is on with respect to Green Hydrogen and Derivatives.

Nuclear Power is seeing a renaissance across the globe. The fleet mode of 10 PHWRs has begun with the award of Kaiga and NTPC-NPCIL JV has been formed for Mahi-Banswara. Chutka, Gorakhpur 3&4 and Mahi-Banswara 3&4 are the next PHWRs and the government intends two more fleets following this and has already approved five new sites.

The FBR at Kalpakkam, once commissioned and operational, will see new units planned and imported reactors of VVER, EPR and APRs are also under discussion. The Niti Aayog is planning SMRs – possibly replacing Coal Plants in the coming decade.

The Government has given impetus to PCPIRs – i.e., Petroleum, Chemicals and Petrochemicals Investment Regions – four such investment SEZs have been created in Vizag, Cuddalore, Dahej and Paradeep. Under the new PCPIR Policy 2020-35, a combined investment of Rs. 10 lakh Crores (US\$ 142 billion) is targeted by 2025, Rs. 15 lakh Crores (US\$ 213 billion) by 2030 and Rs. 20 lakh Crores (US\$ 284 billion) by 2035 in all PCPIRs across the country. Oil majors plan Refinery Integrated Petrochemical plants and by 2035, India is expected to have 15 mega-scale plants. Consumption of Petrochemicals in India is 12 kg per capita, one-third of the global average of 37 kg. This is expected to rise threefold by 2040. The petrochemical industry is also growing in Southeast Asia and the Middle East Regions.

The Government is giving impetus to energy transition through PLI Schemes – the manufacturing industry related to Solar Cells, Battery Storage and Semiconductors is seeing major developmental activities. The PLI scheme is for polysilicon, ingots & wafers, cells and modules for a minimum of 1 GW and a maximum of 10 GW for the entire chain or 6 GW for only wafers, cells and modules.

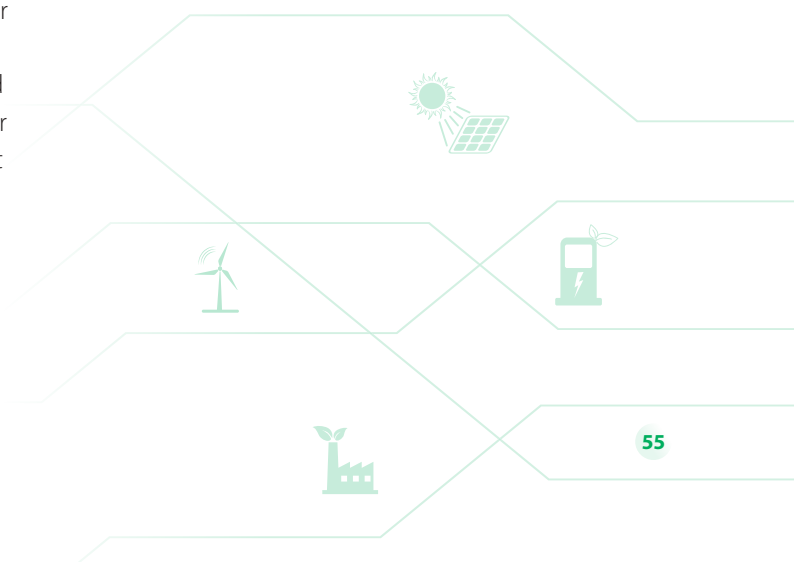
Efficiency and content of local value additions have also been defined and incentives will be on the sales for over five years. On Semi-conductors – under Make in India, the share of locally sourced semiconductors is expected to increase from 9% last year to 18% by 2026. And under the China+1 sourcing strategy, India is looking at export potential also, as stated by the Honorable Minister recently at the World Economic Forum.

The government intends to make India one of the global manufacturing hubs of ESDM (SC & Display Fab) by providing 50% of the project cost as incentives on an equal footing.

As per Niti Aayog's accelerated EV Adoption Scenario at 40% EV share by 2030, India needs 26 Gigafactories of 10GWh per year. A more conservative scenario will be 10 Gigafactories of 10 GWhr per year. The Government has approved the Production Linked Incentive (PLI) Scheme 'National Programme on Advanced Chemistry Cell (ACC) Battery Storage' for achieving a manufacturing capacity of 50GWh of ACC to enhance India's manufacturing capabilities with a budgetary outlay of Rs. 18,100 crore.

On the metals front, the consumption of steel, Al, Cu and Zn in India is one-third global average and one-tenth that of China – for a country stated to have overtaken China this year in its population. India is the second largest producer of steel and the fourth largest producer of Zinc. The evolution of the EV industry is good news for Aluminium and Copper. Using aluminium instead of steel enhances EVs' performance, safety, fuel efficiency and durability and renders many environmental benefits. An ICE Car uses 23kg of Copper, whereas an EV uses 83 kilograms of copper on average.

Green steel pilots are planned in Phase 1 of NHM and commercial scale projects will come up post 2026. The decision of the government to replace 15-year-old vehicles is a growth opportunity for Metals. There are three copper smelters under construction in the world today and two of them are being done by TCE. The availability of Hydrogen is necessary for the green metal industry to take off as no intermediary stage of natural gas is available. TCE is doing the first-of-its-kind GISTM (Global Industry Standard on Tailing Management) implementation projects in India with an Australian partner.



CLUSTER PERFORMANCE FY 2022-23

POWER 	RESOURCES HYDROCARBONS & CHEMICALS 	RESOURCES MINING & METALLURGY 
<ul style="list-style-type: none"> • Nuclear • Green Power (Solar, Wind, Hydro) • Thermal • Transmission & Distribution • New Technologies (Digital, Hydrogen) 	<ul style="list-style-type: none"> • Oil and Gas Refineries • Petrochemicals • Fertilisers • Chemicals & Specialty Chemicals • Food & Pharmaceuticals • Glass, Rubber, Cement and Allied Process Industries 	<ul style="list-style-type: none"> • Iron & Steel • Mining & Beneficiation of Ferrous & Non-ferrous Ores • Smelting and Processing • Geology and Mine Planning • Mineral Processing and Beneficiation • Material Handling

The year proved to be the best for the Cluster in terms of acquisition, revenue, PBT, billing, collection and LWC reduction. PED Cluster accounted for 57% of TCE's acquisition and 50% of Revenue in FY 2022-23. This financial performance amidst challenges of global resignation and competent resource crunch in the market once again demonstrated the resilience of the cluster to take on challenges and scale new heights hitherto not conquered.

The individual businesses bid for and won some of the largest deals ever for the cluster, collaborating effectively with the international marketing group. 55% of business acquisition and 63% of revenue for the cluster was from International accounts. Key and strategic accounts contributed 52% of revenue, demonstrating customer connects and delivery effectiveness. 70% of these key accounts are international accounts reinforcing the importance of proper business mix. The customer feedback was positive and the cluster outperformed the competitors.

The reality of Energy Transition drove the cluster to identify decarbonisation pathways for the chemicals, steel and power sectors. Clean Power (Nuclear) grew by 209% in the acquisition, aided by the long pending orders awarded this year and TCE's involvement in the ITER account, which continues to grow with an effective partnership ecosystem. TCE joined hands with Niti Aayog to write a whitepaper on Small Modular Reactors (SMR) that would be released at a G20 conference in 2023.

Green Power (renewables and hydro) registered 85% growth in acquisition and 32% growth in revenues aided by the renewed focus on Pumped Storage Projects (PSP) and Large Ground Mounted Solar Projects.

Work continued designing the world's first large-scale green hydrogen/green ammonia plant in the Middle East, the pilot project on green methanol from blast furnace gas and a 1G/2G bio-ethanol refinery for blended fuel usage. TCE associated with the Indian Institute of Science to work on a basic design and engineering package for a pilot 10 kg/hr green hydrogen plant from biomass for IOCL. A DPR for a 100 kg/hr biomass-based green hydrogen plant is underway.

Further, work began on a 2 GWh Battery Manufacturing Plant for an auto major. Work is also ongoing for a 4 GW solar cell manufacturing facility. On the metals front, work continued on new steel making technology – Hlsarna pilot plant and green EAF route for integrated steel plant. TCE is now associated with a global steel major on decarbonisation pathways for European steel plants.

TCE is also implementing Global Industry Standards for Tailing Management (GISTM) in the mines of a steel major in India along with an Australian partner. Such prestigious and diverse projects showcase the cluster's ability to take up new challenges and the penchant for new technologies and focus on learning and development, paving the way for future growth. Cluster revenues from Energy Transition projects grew to 30%, reflecting the cluster's strides in this strategically important growth area.

The cluster achieved the highest-ever 33 entries in Tata Innovista, a Group platform showcasing innovation. A system to regulate flue gas exit velocity from chimneys has been granted a patent and two other applications in green power are currently at various stages of patenting.

CLUSTER PLANS FY 2023-24

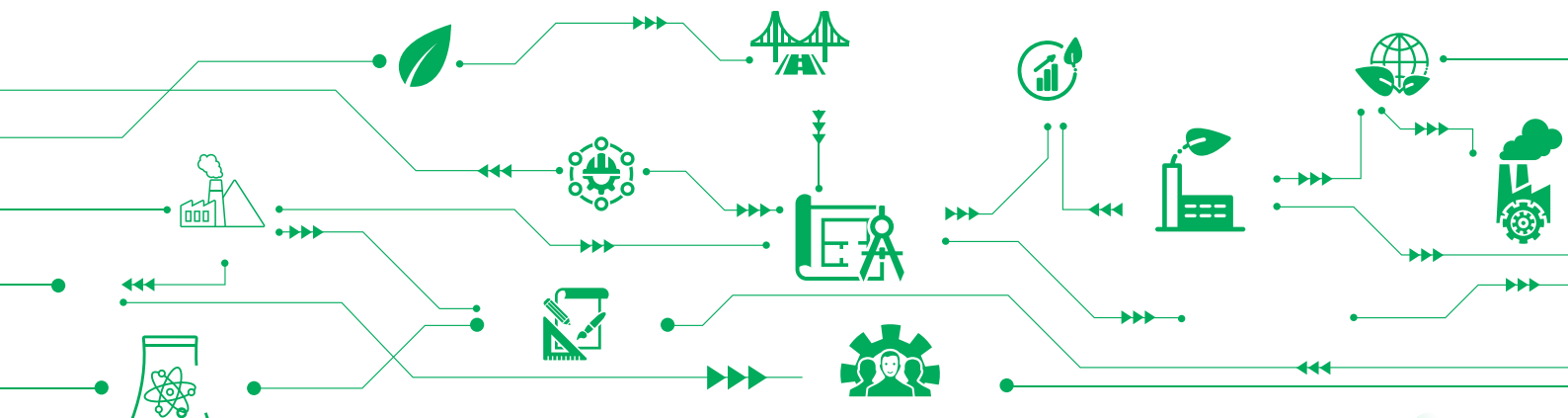
With 73% of cluster revenue already available in its jobs in hand, the cluster is expected to continue its stellar performance in FY 2023-24. While the continuous flow of jobs from key and strategic accounts brings business sustainability, the cluster is actively working on strategic opportunities in hydrogen, ammonia, biofuels, fertilisers, refineries, petro and speciality chemicals, non-ferrous metals, nuclear, hydro and renewables.

Energy transition and net zero targets continue to grow the cluster in new areas. Clean and green energy will remain the sector's focus in this decade. The process industry is reinventing itself, focusing on green chemicals, fertilisers and metals. While the Middle East has taken the first steps in implementing green hydrogen and associated chemicals chain at scale – the efforts to reduce carbon footprint are on across the globe. The following financial year is expected to bring enormous opportunities in green chemicals and metals from existing accounts and bear the fruits of efforts made so far in meeting some of the qualification requirements in key areas in the resources sector.

The PED cluster will focus on implementing its strategic plans in sunrise sectors, proactively advocate for its value-added services through the government and private players and develop and acquire capabilities to be the key player in providing engineering and project management services in green energy transition across sectors. Collaboration amongst the business units of chemicals & hydrocarbons, mining and metallurgy and power will be a key focus area – especially in Energy Transition.

Learning & Development efforts are planned at the cluster level to build future competencies. Further, job rotations of senior resources for leadership opportunities and creating a shared pool of junior resources for providing challenging opportunities that would enhance engagement and talent retention will be the way to growth. The renewed Accelerated Delivery Center is expected to bring in productivity improvements at scale to improve the cluster profitability.

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POWER BUSINESS REVIEW

With over six decades of experience in the power industry, the Power Business of Tata Consulting Engineers is among the top two players in the Indian market. TCE takes pride in designing more than 200 GW of power and 85% of India's nuclear power & related infrastructure facilities. The power business serves green energy (Renewables & Hydro), nuclear, transmission & distribution and Thermal sectors. The Company supports its customers in the complete asset lifecycle management of power plants, from feasibility studies, conceptual design, basic and detailed engineering, procurement assistance, project management, field engineering & commissioning support during the project development phase to asset sustenance during the plant operational phase.

KEY TRENDS SHAPING THE INDUSTRY

- Renewable energy has gained prominence in recent years. Countries and corporations have planned significant investments as they pledge their climate change combat goals. As per NIP (National Infrastructure Pipeline), 9.3 lakh Crores INR investment is envisaged in the Renewable sector.
- As per the announcement in COP26, the Renewable energy target has been increased to 500 GW, of which 70-100 GW is from Hydro and the balance from Solar and Wind. This keeps India's options open for new coal-based power plants in the projected 820 GW total capacity.
- Pumped Storage Hydro-Electric Plants (PSHEPs), the world's 'Hydro battery', account for over 94 per cent of installed global energy storage capacity and retain several advantages such as lifetime cost and sustainability levels scale. Further, PSHEPs support power grid stability, reducing overall system costs and carbon emissions.
- India has recognised Nuclear power in the proposed mix of clean energy sources to meet net-zero targets. India is pursuing a three-stage nuclear program to utilise thorium as a long-term fuel source for nuclear power generation.
- With increased renewable penetration comes the challenge of maintaining Grid stability. Energy storage becomes imminent to mitigate these challenges.
- Indian government is committed to developing its nuclear capacity to 22480 MW by 2031.
- A target of 22480 MW is planned to be achieved through reactors under construction. Ten additional indigenous Pressurised Heavy Water Reactors (700 MW PHWRs) are designed to be set up in fleet mode progressively by 2031.
- Small Modular Reactors (SMRs) are small nuclear power reactors planned to be realised through extensive use of a modular approach in manufacturing and installation. The overarching theme driving the SMR development is to conceptualise, design and realise a standardised small nuclear reactor with a serial production approach in a factory setting where a controlled environment and use of the modern-day Industry 4.0 paradigm can achieve superior quality and cost optimisation.
- Battery Energy Storage System (BESS) will significantly enhance power system flexibility and enable a higher level of renewable integration. It aids in energy Arbitrage that helps reduce Renewable energy curtailment and load levelling. Apart from capacity firming and Energy shifting, it provides various ancillary services such as primary frequency control and regulation. It also helps in Transmission and Distribution investment deferral and is used as a Black start in the grid.


- Investments are shifting away from conventional Coal/Gas fired power plants to Advanced Ultra Super Critical power plants, Large gas based power plants, Captive/Cogeneration plants and Green Hydrogen/ Ammonia Generation. Decarbonisation initiatives and projects include Power Plant Performance Improvement & Flexi Operation, Emission Retrofits, BFG and H₂ firing in GT, Coal to Gas plants, Carbon capture projects and Thermal Energy Storage market.


KEY AREAS OF EXPERTISE

1. **Hydro & PSPs:** Planning, designing and implementing comprehensive services from concept to commissioning of various facets of hydropower projects involving, Dams, Tunnels, Low / High-Pressure Steel Penstocks, Power Houses and Turbine-generator units & Power evacuation. Strengthening and Rehabilitation of old dams, including safety reviews. Experience in renovation and upgrade of hydropower stations
2. **Thermal:** With a six decades legacy in thermal power, TCE has in-house expertise in:
 - Hydrogen economy, Generation and processes.
 - Energy Audits and Plant O&M.
 - Asset performance management & digitalisation
 - O&M Globally practices.
 - Power plant flexibilisation and repurposing
 - Carbon capture and reuse
 - Coal Gasification
 - Integrated Plant 3D Engineering
3. **Renewable:** Expertise in Planning, designing and implementing comprehensive services from concept to commissioning Solar, Wind, Battery Energy storage (BESS) and Floating Solar PV (FSPV) plant and hybrid plants.
4. **Transmission & Distribution:** In-house expertise in Battery Energy Storage System (BESS) design.
5. **Nuclear:** Competency in Comprehensive engineering, Procurement and Construction / Program management of Nuclear islands
 - Competency in Conventional Island and Balance of Plant from Concept to Commissioning, including all aspects of Engineering, Procurement and Construction/Program management.
 - Versatility in terms of detailed engineering capabilities of fission reactors such as PHWR and PWR as well as fusion reactors such as ITER and the nuclear fuel cycles facilities such as NFC, VWSF, FRFCF and INRP
 - Seismic Re-evaluation and margin assessment of the operating nuclear power plants for remnant lifetime assessment
 - Special analytical techniques for design and qualification of nuclear safety class SSCs
 - Initiation of developmental activities in new areas of the nuclear industry, such as Localisation of EPR, SMA of Indian Reactors and SMRs


With over six decades of experience in the power industry, the Power Business of Tata Consulting Engineers is among the top two players in the Indian market. TCE takes pride in designing more than 200 GW of power and 85% of India's nuclear power & related infrastructure facilities.


KEY ACHIEVEMENTS


 **Successful completion of the engineering consultancy contract** for the Integrated 3D Modeling Based Detailed Engineering of 2 x 700 MWe Units 1 & 2 in Haryana


 **Deployed more than 63 IPAs (ITER Project Assistants) onsite, handling various roles across ITER projects.** Securing continuous off-shore engineering assignments from ITER-France, including technology-intensive assignments like High Energy Line Break (HELB), design of complex platforms at various levels of Tokamak complex and qualification of critical piping and its supports inside the Port cell area.


 **Award of the 3D Modeling and Detailed Engineering Contract for the 2 x 700 MW Nuclear Power Plant,** the largest single consultancy project in the sector.


 **NITI Aayog of the Government of India entrusted TCE Nuclear** with preparing a Status Report on the "Critical Role of SMRs in Energy Transition."

 **Proposal, Basic and Detailed engineering for more than 3 GWH capacity projects.** Carried out a Basic Engineering services project for India's first and largest Grid-connected BESS project.

 **Move towards offering solutions rather than services** in areas such as Green Hydrogen, Asset Performance Management & digitalisation, Power plant flexibilisation and Repurposing Thermal Plants.

 **Secured major Green Hydrogen/ Ammonia projects in the Middle East and Hydrogen pilot projects from Indian Power giants.** Also secured multiple Fuel Gas Desulphurisation (FGD) projects and feasibility studies on integrating Renewable Energy (RE) Generation with Thermal Generation for a 2 x 660 MW power plant.

 **Successfully implemented Skid Mounted Transcritical CO₂ Ship Cooling project.** The state-of-the-art training unit is expected to be highly compact and portable, utilising the latest technology available for CO₂.

 **Retained by the client for test setup and demonstration of near isothermal compression and expansion Gas Compression pilot project.** This project can significantly improve Gas compression efficiency and be used in several compressed air/gas storage applications, particularly Green Hydrogen Storage.

KEY INITIATIVES THAT HELPED PROVIDE BENCHMARK RESULTS

- Integration of commercial software and in-house processes to serve the need of a design consultancy in the nuclear industry
- Complete automation of several engineering processes aligned with the 3D way of working, including the isometric extraction process and several macros for interfacing various disciplines with 3D engineering
- Training of resources on key software such as the CADMATIC 3D modelling platform and the PIPESTRESS
- Focus on continuous technology development in high-end areas
- Gained an understanding of BESS Technologies and developed competency in BESS design well before BESS projects emerged in India.
- Started new sector Viz; Hydrogen, New areas and Digital Sector to focus on future trends in Power Generation Industry in FY 2022-23 while keeping TCE's presence and optimistic growth rate in the conventional power generation sector.



A PROJECT 50 MW WIND POWER PLANT, OTTAPIDARAM, TAMIL NADU

The client has established itself as a leading independent power producer (IPP) committed to India's energy transition. Its India operations have a balanced portfolio of conventional and renewable energy assets totalling more than 5GW capacity in operation and under construction.

Through its wholly-owned subsidiaries, the Company has established itself in identifying, developing and operating power generation assets across the country's conventional and renewable power sectors.

The client intends to install a 50 MW Wind Power plant at Ottapidaram, Tamilnadu, India and has appointed Tata Consulting Engineers Limited (TCE) as Owner's Engineers, including PMC services, on an EPC basis for the implementation of the project. The salient

The TCE scope of services includes Review of the Wind Turbine Generator (WTG) Foundations Design, Review of WTG major components design specification, Review of the Internal External power line and Pooling substation 33/110 kV system, FAT for significant components and Project management and construction monitoring services.

The project includes 16 WTGs of 3.3 MW Envision OEM, 150 m Tubular Tower Model, 150 m highest Rotor Diameter, 140 m highest Hub Height and 40% Estimated Plant Load Factor (PLF)

KEY CHALLENGES:



- Right of way is the key challenge in the project for both the 33 kV internal line and the 110 kV EHV line
- Availability of main cranes at the site considering the remote location.
- Shortage of skilled workforce in the project from the Contractor's side
- Tight schedule of commissioning: Sept 2023 despite challenges

IMPACT

- Reduction of IT servers per WTGs and design changes in WTG foundations leading to cost savings for the customer.

A PROJECT

1680 MW PINNAPURAM PUMPED STORAGE COMPONENT OF INTEGRATED RENEWABLE ENERGY PROJECT (IREP) AND ITS ROLE IN ENERGY TRANSITION

Out of all storage technologies, Pumped Hydro Storage Project (PSP) is a well-established and matured technology. It can facilitate improved energy security and transition to a lower-cost, low-carbon electricity market that requires flexible, dispatchable and peak power capacity. PSPs, the world's 'Hydro Battery', account for over 94 per cent of installed global energy storage capacity and retain several advantages such as lifetime cost, sustainability and scale.

This Pumped storage component of the Integrated Renewable Energy Project (IREP) of 1680MW (6 x 240MW + 2 x 120MW) storage capacity is located at Kurnool District, Andhra Pradesh. TCE is the design review consultant for this PSP development.

Pinnapuram IREP pumped storage project envisages the construction of two reservoirs in natural depressions with the embankment height varying from 12m to 40m to create the desired storage capacity. A Pit type powerhouse of size 215m (length) x 26 m (width) x 49 m (height) is being constructed with a deep excavation of 100 m located between two hills housing eight (8) pump-turbine generator units totalling 1680 MW capacity.

The off-stream closed loop PSP is a stand-alone project and both reservoirs are located away from all existing natural water systems. The project envisages the non-consumptive re-utilisation of 34 Mm³ of water for recirculation among two proposed reservoirs.

KEY CHALLENGES:

- Conceived as the world's first and largest Gigawatt Scale integrated project with solar, wind and pumped storage components to supply Schedulable Power on Demand (SPOD), the project has no reference.
- Tight commissioning deadline of 30 months.

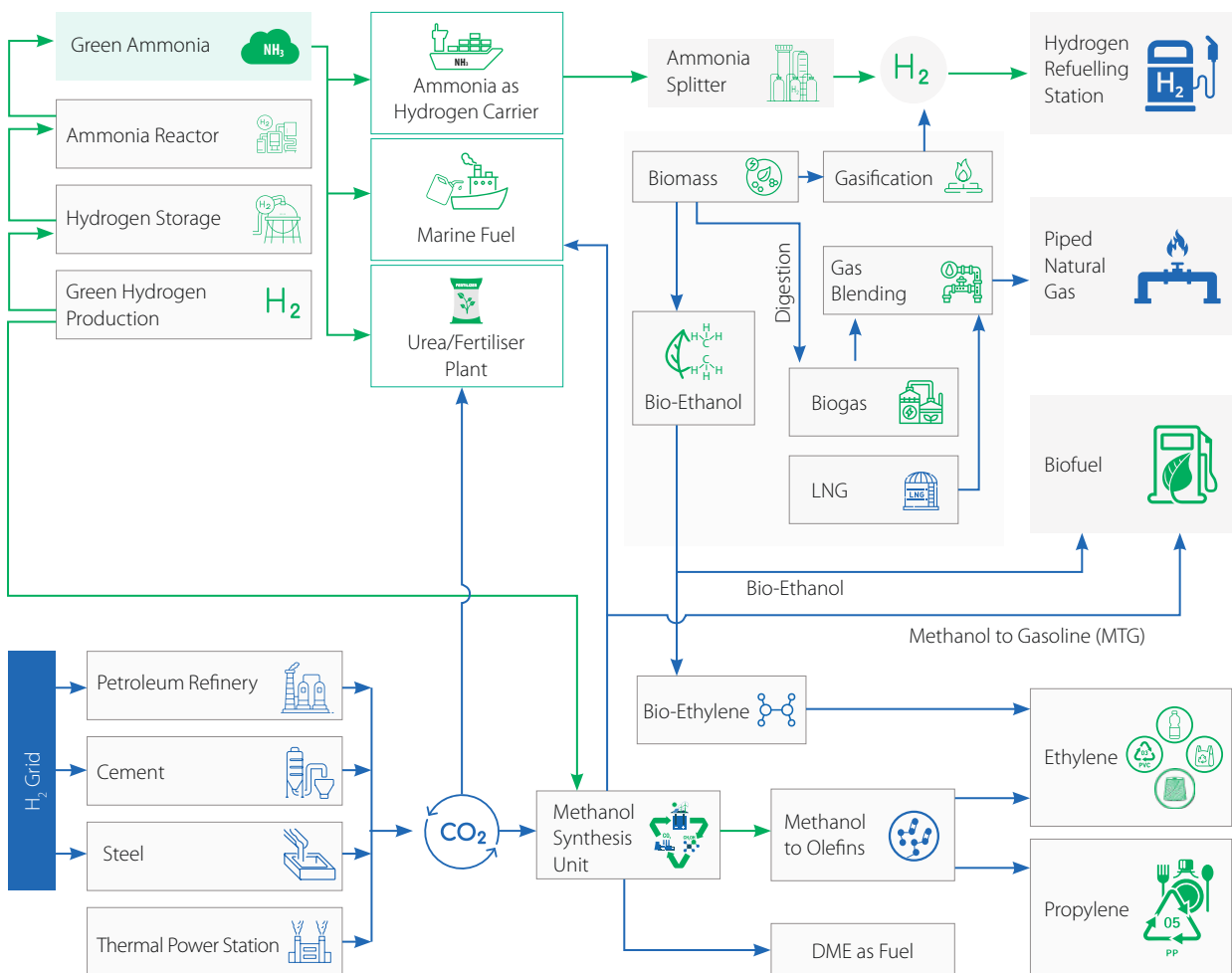
IMPACT

- Design value additions to save immense cost and time

HYDROCARBONS AND CHEMICALS BUSINESS REVIEW

The Hydrocarbons and Chemicals Business (HCBU) provides Concept to Commissioning services, including Value Chain Integration, Schedule Optimisation using 3D/4D simulations and Value Engineering to industry sectors like Oil, Gas & Refineries, Chemicals & Petrochemicals, Specialty Chemicals & Agrochemicals, Fertilisers, Pulp & Paper, Pharmaceuticals, Cement, Food & Beverages, Tyre & Tube etc.

Safety in Design and operations is critical in the Hydrogen and Chemical Industry; hence the HCBU workforce is oriented to a Safety Instrumented System (SIS), one of the most important layers of protection against accidents and hazards in the industry. HCBU workforce has also adopted a High Integrity Pressure Protection System (HIPPS), a type of SIS designed to prevent over-pressurisation of a plant.



GREEN CHEMICALS AND LOW CARBON PATHWAYS

KEY TRENDS SHAPING THE INDUSTRY

Energy transition and decarbonisation are shaping the future of industries across the globe. The Hydrocarbons and Chemicals business is no different. Green Hydrogen and Derivatives are at the forefront of the Energy Transition, adding impetus to the growth potential. Several large-scale opportunities are shaping up in the green ammonia space in India, the Middle East and Africa, with investments from Europe and Japan.

The National Hydrogen Mission in India has also identified Green Ammonia production targets for 2030. It further sets an eye on Electrolyser Manufacturing with appropriate funding assistance to ensure the country progresses on the decarbonisation pathways.

Green fuel is already a reality. Several Bio-ethanol plants are being set up in India and policies are already in place for blended fuels for transportation as the middle path towards transitioning to electric vehicles.

Green Methanol pilots are also being targeted by industries heavy on emissions. Biomass-based green hydrogen pilots are underway. Fuel Cell Electric Vehicles (FCEVs) with hydrogen as a fuel are also being piloted.

Railways have announced hydrogen fuelled pilot trains in the hilly regions and aircraft manufacturers have piloted flights with sustainable aviation fuel (SAF). Hydrogen fuelled aircraft have also been piloted already. While most current technologies focus on HEFA (Hydroprocessed Esters and Fatty Acids) fuels made of vegetable oils, SAF can be produced from various routes, including bioethanol and combining hydrogen with captured CO₂ by industries.

The focus on VREs (Variable Renewable Electricity) for power generation and green transportation (battery and fuel cell electric vehicles) needs energy storage. Several large-scale battery manufacturing giga-factories are being set up in India and abroad. The recently found lithium deposits in Jammu & Kashmir regions are good news for domestic industries.

Global geopolitics and the resultant C+1 strategy for manufacturing have resulted in several opportunities coming up in silicone-based semiconductor manufacturing plants. Domestic manufacturing thrust by the government is also bringing in several opportunities in solar cell manufacturing giga-factories. Metallurgical and Electronic Grade Silicone manufacturing plants are set up in India. The focus is on manufacturing ingots, wafers, cells and modules across the value chain.

The petrochemical industry in India, the Middle East and ASEAN regions is witnessing large-scale investments and huge growth potential. Indian market is expected to grow at 6+% CAGR till 2030. Along with feedstocks for speciality chemicals, the focus is on adding capacities in polyethylene, polypropylene, PVC, PTA, elastomers, construction chemicals, adhesives, paints, etc. The state-owned refineries have planned refinery integrated large-scale petrochemical plants. Several domestic private players and international brands have announced investments and partnerships in the petrochemical industry, given India's less-than-global average consumption.

The Hydrocarbons and Chemicals Business (HCBU) provides Concept to Commissioning services, including Value Chain Integration, Schedule Optimisation using 3D/4D simulations and Value Engineering to industry sectors like Oil, Gas & Refineries, Chemicals & Petrochemicals, Specialty Chemicals & Agrochemicals, Fertilisers, Pulp & Paper, Pharmaceuticals, Cement, Food & Beverages, Tyre & Tube etc.

KEY AREAS OF EXPERTISE

Specifically on Energy Transition, the team has been working on several areas such as green ammonia and methanol through Haldor Topsoe technology; working with the Indian Institute of Science, Bangalore, on biomass gasification to produce hydrogen; working with a client on 1G/2G bioethanol plants; working with a steel giant on green methanol; working with several customers on battery manufacturing plants, semi-conductors manufacturing plants and is in active discussion to procure electronics grade silicone manufacturing plant.

The business unit has qualifications needed for green chemicals, petrochemicals, speciality chemicals, utilities and offsites, depots and terminals, retail outlets in hydrocarbon midstream and downstream refineries, petrochemicals sector.

The team has unique expertise in process engineering across oil & gas, green chemicals, biofuels, speciality chemicals, paints, fertilisers, food and pharma industries, along with multi-disciplinary engineering and design capabilities from the conceptual stage to lifecycle management across the chemical, mechanical, civil, instrumentation and control and electrical engineering. The business has vast experience in domestic and international markets. It is associated with some of the marquee names in the industry and the team possesses program management experience in managing large annuity accounts.

KEY ACHIEVEMENTS

Working on several Energy Transition projects, including

- » **Green Ammonia through Haldor Topsoe technology** – Project under execution for a 300TPD green ammonia plant in the Middle East
- » **Green Methanol through Haldor Topsoe technology** – Project under execution for a steel major on 10 TPD green methanol plant through CO₂ capture from Blast Furnace Gas
- » **Biomass gasification to produce hydrogen** – working with the Indian Institute of Science Bangalore for a 10 kg/hr hydrogen pilot plant
- » **MoUs signed with two developers** for modular-containerised standard solutions for Alkaline & PEM electrolyzers
- » **Working with a client on 1G, 2G 100 KLPD Bioethanol plant** using PRAJ technology
- » **Working with an Auto-major** for a 2 GWh Li-ion battery manufacturing plant



The highest ever Acquisition, Accrual, PBT, Billing and Collection; the lowest LWC on an annual basis

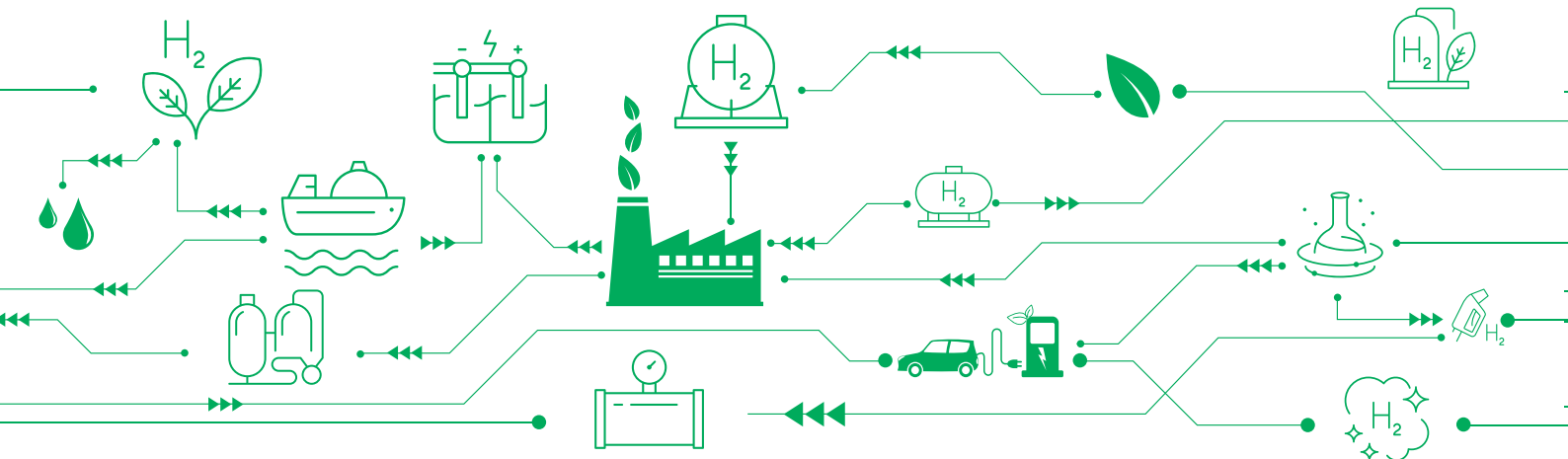
Highest ever eight applications for Innovista with 4 in Design Honour and 4 in Implemented Innovation categories

Working with a Japanese Major for a large Petrochemical project in Thailand involving 150 engineers and modellers

The preferred engineering alliance partner for a Middle East Client graduated from site project activities to registration for Mega projects to now working with EPCs of the client

KEY INITIATIVES THAT HELPED PROVIDE BENCHMARK RESULTS

- Focus on Large Deals, Key Accounts and Energy Transition:
 - » Secured order from a Steel-major for a Green Methanol pilot plant using Blast Furnace Gas
 - » Working with the Indian Institute of Science on green hydrogen using biomass
 - » Made foray into Battery Manufacturing Giga-factories through two large auto-majors
 - » Penetrated EPCs of a Middle East client for petrochemical opex projects; the client Dedicated Engineering Centre (DEC) continues to grow
 - » Large deal secured from a Japanese client for a large-scale VCM/PVC manufacturing plant in Thailand
 - » Two Large deals secured in Fertilisers for projects in India and Nigeria
 - » Working on five plants across India for a decorative paint manufacturing major
- Growth Initiatives in Delivery
 - » Empanelment of industry experts with more than 35 years of individual experience to build processes and help prepare the talent pool to serve growing business needs
 - » Leveraging Accelerate Delivery Centre (ADC) for detail engineering – Implementation of learning from earlier retail outlet projects in the ongoing retail outlet project through a ‘factory model’ where 80% of efforts are coming from ADC
 - » Collaboration with the Technology team – from proposal preparation and identification of value engineering opportunities to critical design reviews, Innovations and Energy Transition
 - » The weekly task look-ahead schedules are shared with each team member and are reviewed daily
 - » Collaboration with other business teams for resource sharing along with continuous hiring efforts to offset attrition challenges





A PROJECT
ENGINEERING SERVICES FOR VCM PVC PLANT IN THAILAND

The global Japanese EPC Company client is setting up a 400,000 TPA VCM PVC plant in Thailand. The project involves 500+ equipments and 4500+ lines.

This engineering support project is a first for TCE with a Japanese client. The project is being executed through a dedicated task force at the TCE Mumbai office, and the client's team is also part of the task force.

TCE's Scope includes Detailed Engineering covering Process, Piping, Instrumentation & Controls and HSE involving 150 personnel.

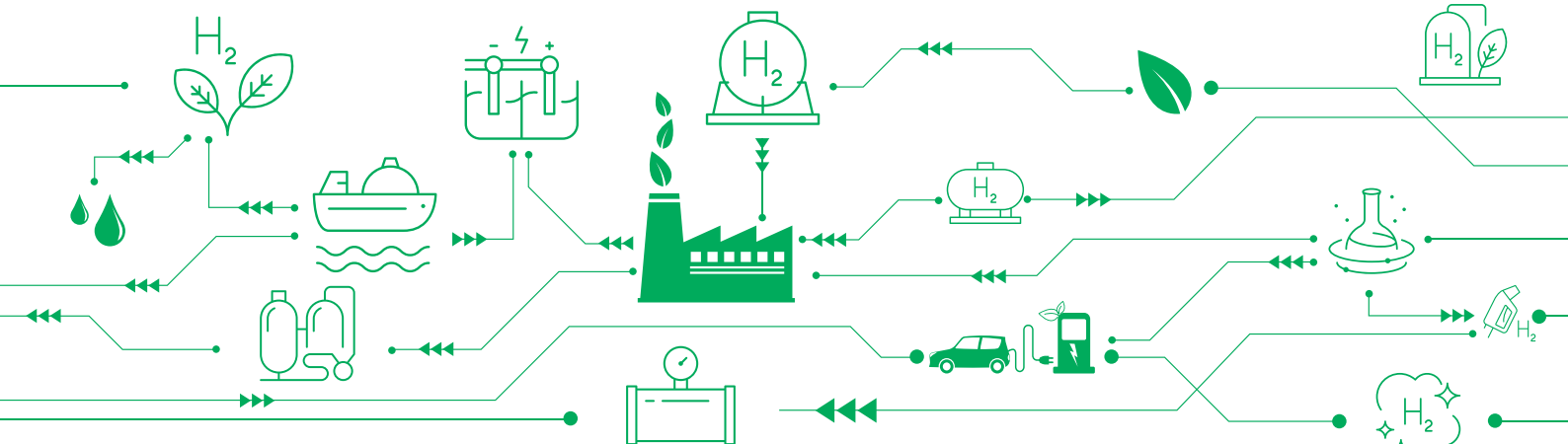
KEY CHALLENGES:



- Multi-location execution leading to delays in decisions. TCE mitigated this by creating a dedicated task force, including representatives from Manila & Yokohama.

IMPACT

- Cost-efficient engineered solutions for quality engineering design.
- Flexible deployment model for optimum utilisation.



A PROJECT

ASIA'S LARGEST DECORATIVE PAINT COMPANY PLANS TO EXPAND AND UPGRADE TWO OF ITS PLANTS.

In one project, the client plans to upgrade the existing manufacturing plant in Gujarat for a total output production of 2,80,000 KL annually. The overall plot area of the plant is 41.7 Acres. The salient features of this scope are Approx. 500 Nos of PIDs, Approx. 3500 pieces of equipment, Approx. 20,000 Pipelines and Approx 60,000 IOs

In project two, the client is planning to expand its Mysuru paint manufacturing plant from the existing capacity of 300,000 KL to 600,000 KL per annum, making it the world's biggest paint plant in a single location. The plant is set up over 175 Acres of land. The salient features of this scope are Approx. 200 Nos of PIDs, Approx. 1600 pieces of equipment, Approx. 8000 Pipelines and Approx 36,000 IOs

TCE is providing EPCM services covering all disciplines - Process, Mechanical, Civil, Electrical, Instrumentation and Project Management for both the projects.

KEY CHALLENGES:

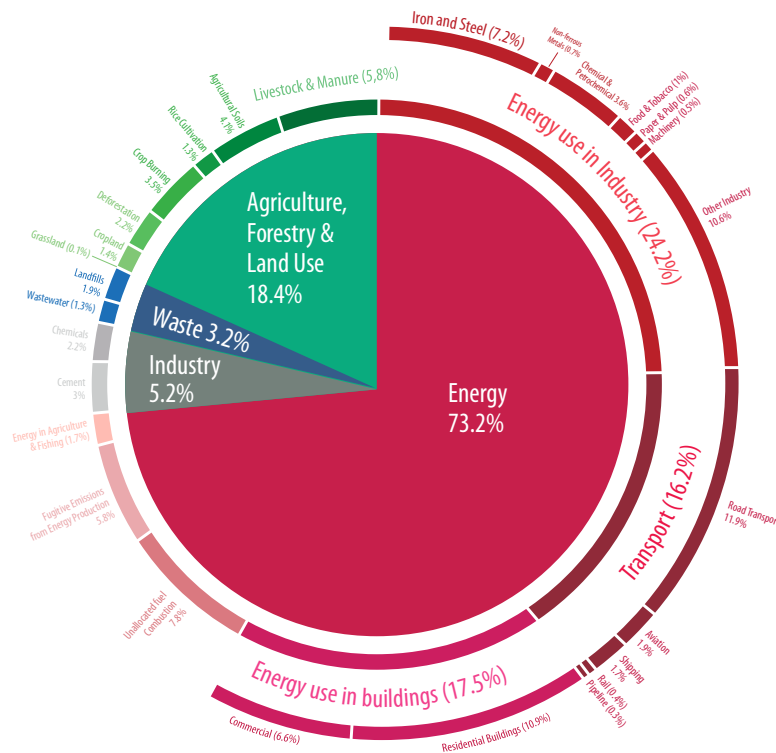
- It is a state-of-the-art brown field expansion project
- Phase-wise execution approach adopted in a running plant to address space constraints
- The project entails highest number of process equipment (Approx. 3500 Nos) and highest number of pipelines executed by TCE till date.
- Evaluation of various cost-effective solutions to offer most optimum design to keep the project cost under control due to changes in market dynamics.
- Optimum project execution schedule.

IMPACT

- Innovative design using state-of-the-art automation technology. Producing more than 250 types of paints in the same plant.
- Capacity expansion in decorative Paint to ensure market share.

MINING & METALLURGY BUSINESS REVIEW

Steel is one of the core pillars of today's society and one of the most important engineering and construction materials. It is also the most abundantly used metal in any form in the universe, so much so that the extent of development of any economy in the world, even today, is determined by per capita steel consumption. The higher the per capita steel consumption more developed the economy is.



GLOBAL GREENHOUSE GAS EMISSIONS BY SECTOR

However, the industry now needs to cope with the challenge of reducing its carbon footprint from both environmental and economic perspectives. The steel sector is key in achieving climate goals, accounting for 2.6 gigatons of carbon dioxide (Gt CO₂) emissions annually, nearly 7% of global emissions. The situation is going to be aggravated as the worldwide steel demand is projected to increase by more than a third through to 2050 and CO₂ emissions are projected to continue rising, despite a higher share of less energy-intensive secondary production, to 2.7 Gt CO₂ per year by 2050, i.e., 7% higher than today.

To meet the Paris Agreement objective of limiting global warming to 1.5 °C, global CO₂ emissions must decline on an unprecedented scale, reaching net zero in 2050. To comply with this overall goal, direct emissions of the steel sector and related carbon intensity must decrease by approx. 70-90% by 2050 from 2020 levels (IEA, 2021). This shows that the steel industry has a long way to go to reach near zero emissions and how to achieve the carbon neutrality target is a game changer for the steel industry, calling for a disruptive transformation of the sector. This disruptive transformation is going to bring new challenges that are likely to reshape the steel industry.

KEY TRENDS SHAPING THE INDUSTRY

- **Decarbonisation:** Steel industry is one of the largest emitters of carbon dioxide, with emissions coming from a few locations. While the industry must adjust to these new conditions, it can also take advantage of them to protect its right to continue doing business in the long run.
- **Energy Transition:** The Energy Transition Commission works with the steel sector to create a supportive policy, market and economic environment that will encourage investment in the production of zero-emission steel in the context of the Net-Zero Steel Initiative. The Initiative is now researching what kind of demand signal could spur investment in innovative technologies while creating a standard set of policy recommendations.
- **Emerging Green Steel Technology:** The main aim is manufacturing Green and Clean Steel without using fossil fuels. This can be done by:
 - **H-DRI/Scrap** – EAF-based routes using low-carbon energy sources such as hydrogen, coal gasification, or renewable electricity instead of coal-fired plants' traditional carbon-intensive manufacturing route.
 - **Low-carbon hydrogen** (blue and green hydrogen) to help reduce the steel industry's carbon footprint.
- **Substituting the Primary Production Processes with Cleaner Alternatives:**
 - Carbon capture, utilisation and storage (CCUS)
 - Replacing conventional energy sources with Steam Methane Reformer, low-carbon hydrogen and renewable sources.
- **Safety and Assets Management**
- **Digital Transformation in Steel Industry:** Complex manufacturing process like steel production has a high probability of quality deviation due to their energy, material and asset-intensive nature. Therefore, the primary objective of digital transformation is to achieve the "zero-defect" quality goal by identifying the defect, tracing the root cause and adjusting the production processes according to the feedback.

TCE is among the leading players in the Iron and steel industry segment, providing one-stop solutions for its valued customers from mines to metal manufacturing and processing, cutting across the entire value chain and practically providing any and every service as a part of the pit-to-port model.

KEY AREAS OF EXPERTISE

The main pathway in which TCE has already gained a substantial amount of expertise and knowledge are:

- **The solution in the conventional BF-BOF route** is to achieve low emission and high efficiency.
- **Green field and brown field futuristic emerging technology projects** like hydrogen-based steel making, Hlsarna, etc.
- **Replace traditional steel-making routes** with advanced DRI/Scrap based- EAF routes for common emitting or clean pathways.
- **Environment and Sustainability**

KEY ACHIEVEMENTS



TCE has completed various assignments in the Iron & Steel industry and presently carrying out several engineering and consultancy assignments for producing the best futuristic carbon-free and clean Iron and steel.

KEY INITIATIVES THAT HELPED PROVIDE BENCHMARK RESULTS

1. **Process Resource Engagement:** Human capital management is essential to every organisation's success in the rapidly evolving workplace.
3. **Knowledge Accumulation / Training:** TCE organises training/workshops to evolve its workforce for the future, ready constantly.

A consulting firm like TCE has highly skilled, qualified and experienced workforce to be most successful and highly effective.

2. **Capability Enhancement:** To enhance competencies, TCE engineers acquire certification through various training programs from reputed organisations in asset management, project management, advanced technologies, etc.

In-House Training programme:

- Energy Transition & Clean Technology in Steel Industry,
- Application of Green technology in copper smelting
- Green Initiatives in Aluminium and Copper Production



A PROJECT

DECARBONISATION & SUSTENANCE OF EXISTING ASSETS PROJECT AT TATA STEEL IJMUIDEN, NETHERLANDS

Tata Steel Europe envisioned the project to decarbonise its steel production sustainably and deliver the first phase of the gradual transition towards an emission-free steelmaking process.

It plans to decommission the blast furnaces in a phased manner & replace them with a combination of new facilities to be installed on a “greenfield” plot in the existing TSN industrial complex.

TCE was assigned the project and the scope of work included a risk assessment of the overall technology choices and route with respect to overall fitment with the existing plant, material balance & energy balance, hot metal quality to steel melt shop, validation of selected technologies, validation of basic logistics study and its impact on (existing) operations, validation and relocation scheme of the existing facilities where the new upcoming facility is planned to be installed, review of value engineering documents as already carried out by Tata Steel.

The scope also included validation of OPEX covering the consumptions and operating parameters on both input and output sides, including pellets/iron ore, natural gas, hydrogen, electricity, scrap, HBI, steel and CO₂ emissions, review of CAPEX & possible optimisation of the final selected option, review of high-level project schedule, validation of BOQ (+10%/-15%) and final CAPEX.

KEY CHALLENGES:



- Technology selection & proper route based on availability of raw material, CAPEX, OPEX and TSII product mix
- Optimum use of energy to achieve minimum CO₂ emissions
- Compliance of selected route to safety and environmental norms
- Selection of route based on highest technological readiness
- Slag handling based on EU regulations
- Proper fume extraction system
- Availability of electrical power from grid as there is large requirement of power
- Use of H₂ for DRI production
- Planning application permission

IMPACT

- Decarbonisation will help bring down the CO₂ emission levels of the plant
- Less requirement of Natural Gas and fuel
- Relocation of units and re-routing of pipelines



A PROJECT
PROJECT IN TATA STEEL JAMSHEDPUR (HISARNA):

Hlsarna process of iron making, jointly developed by Tata Steel Europe and Rio-Tinto, aims to address CO₂ emission and Environmental pollution. Tata Steel decided to install a demo plant with about 0.7 MTPA hot metal production capacity in Jamshedpur. Hlsarna is an alternative to the blast furnace process. To be able to make hot metal in a blast furnace, it is necessary to pre-process ores and metallurgical coal (the raw materials) into sinter (light chunks of iron ore), pellets (marbles of iron ore) and coke. The Hlsarna process makes these steps superfluous: in the Hlsarna installation, the raw materials can be used in powder form and be directly converted into low Si hot metal.

TCE was tasked with the Conceptualisation and finalisation of the project, which included a concept study including technology and process route selection, development of preliminary general layout, basic concept of furnace preparation, hot metal and slag evacuation, BOP items, material handling, off gas treatment, identification of environmental pollution sources and mitigation measures, capital cost estimation, financial analysis and estimation of annual operating cost & construction quantities.

TCE's scope of work also included the Assessment of Project land area requirement, Identification of candidate location and Estimation of site-related capital costs.

KEY CHALLENGES:

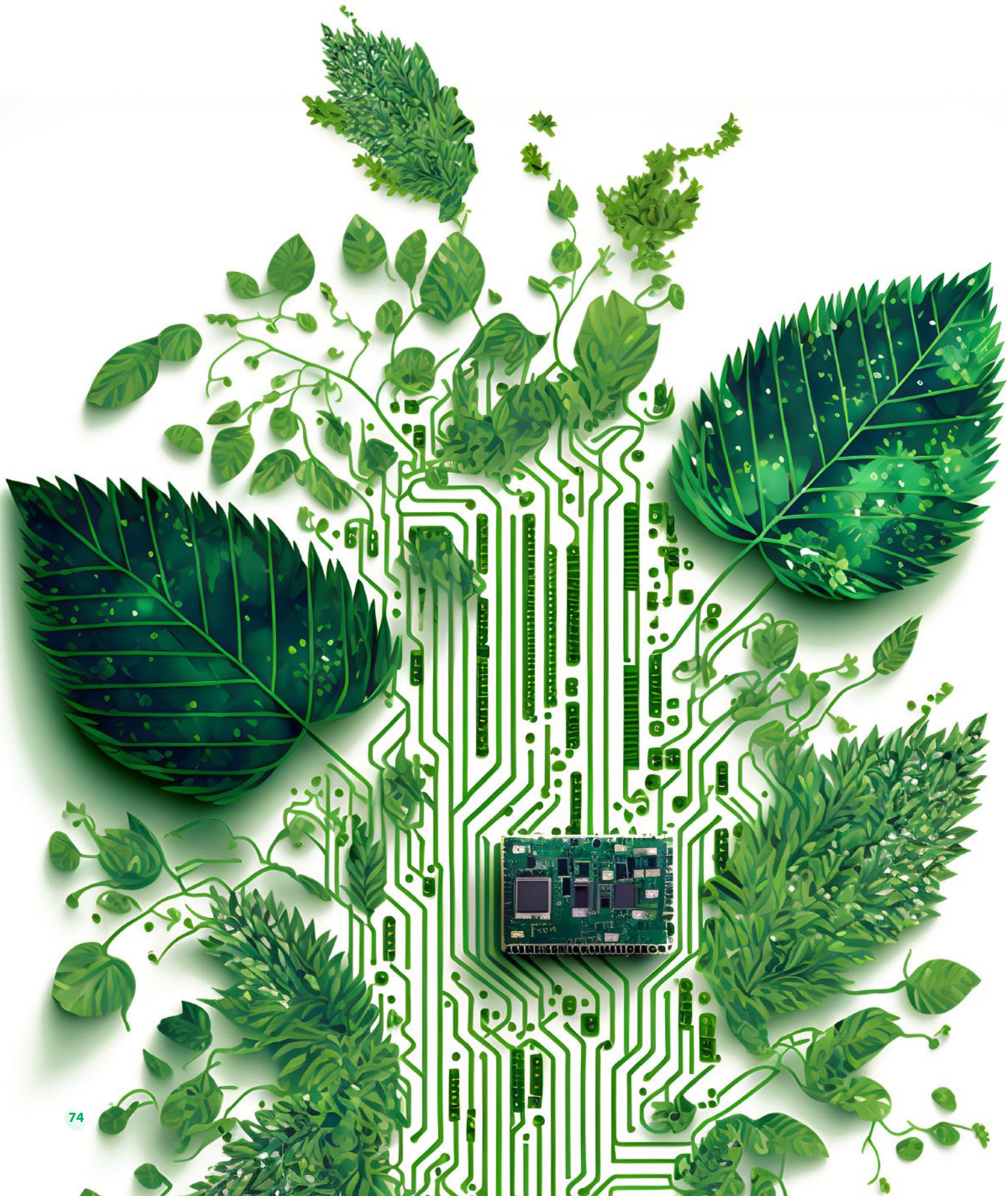


- Raw material preparation wrt size and moisture content
- Off gas treatment and waste heat recovery including De-NOx and De-Sox as per pollution control norms

IMPACT

- GHG emission 20% low compared to Blast Furnace route.
- Very high CO₂ emission reduction can be achieved with carbon capture from off gas as CO₂ percentage is more than 85% in the gas
- Use of non coking coal in place of metallurgical coal
- Very low Si hot metal and low operating cost for steel making.

DIGITAL AND ADVANCED TECHNOLOGIES BUSINESS



POWERING ENERGY TRANSITION

Digital and Advanced Technologies are rapidly altering industries, simplifying business processes and transforming business models. The organisations of today have a dire need to remain nimble and become agile due to the rapidly changing business environment. As sustainability continues to gain momentum, it is sure to maximise the power of digital technologies by employing solutions to optimise operations for emissions reductions, maximise energy efficiency gains and improve climate-related planning. Digital tools will play a critical role in achieving global emissions goals by helping optimise operations, maximise energy efficiency gains and support performance tracking, among many other ways.

122%

GROWTH IN
REVENUE YoY

100%

GROWTH IN
HEADCOUNT

The Digital & Advanced Technologies Business Unit (DATBU) at Tata Consulting Engineers (TCE) was formed to spearhead the digitisation initiative of the Company by positioning itself as a cutting-edge advanced technology service provider.

TCE is poised to deliver value by leveraging its 60 years of domain expertise and a dedicated pool of talented engineers.

TCE continues to consolidate its position as one of the leaders in the Asset digitisation space and has executed many one-of-a-kind projects, one such being the conversion of PDS into an S3D model for an Indian refinery major.

TCE also executed several complex Product Engineering projects for niche sectors like Defence, Space & Astrophysics research.

This year the Company also made inroads in providing End-to-End (Turnkey) solutions for executing several one-of-a-kind product engineering projects for the Defence sector. It also secured a prestigious project for Wind Turbine blade mould.

KEY TRENDS SHAPING THE INDUSTRY

- Digital technology adoption will result in a 20% reduction in Carbon Emissions by 2050
- Smart asset management, efficiency improvement, repurposing assets with green processes and asset life extension are key to a carbon emission reduction of existing asset
- Decarbonisation initiatives by various industries and regulations poised to accelerate digitisation and digitalisation
- AI/ML based solutions will be adopted for locating viable sources of critical metals and Renewables resource locations for solar and winds
- AI/ML base Digital solutions will be adopted for operation and equipment efficiency improvement, predicting failures, life extensions and waste reductions
- Product engineering to leverage the Atmanirbhar Bharat initiative to make the country self-reliant and resilient in Defense & Space sector
- Opportunity for product engineering to productise small-scale (Containerised) Green Hydrogen as energy storage.



• KEY AREAS OF EXPERTISE

- Product Engineering** - Design and Analysis - Strong knowledge of design validation (Strength Analysis, Reliability Analysis) of Electro-Mechanical Products as per applicable codes and standards, providing suggestions on design modifications for code compliance.

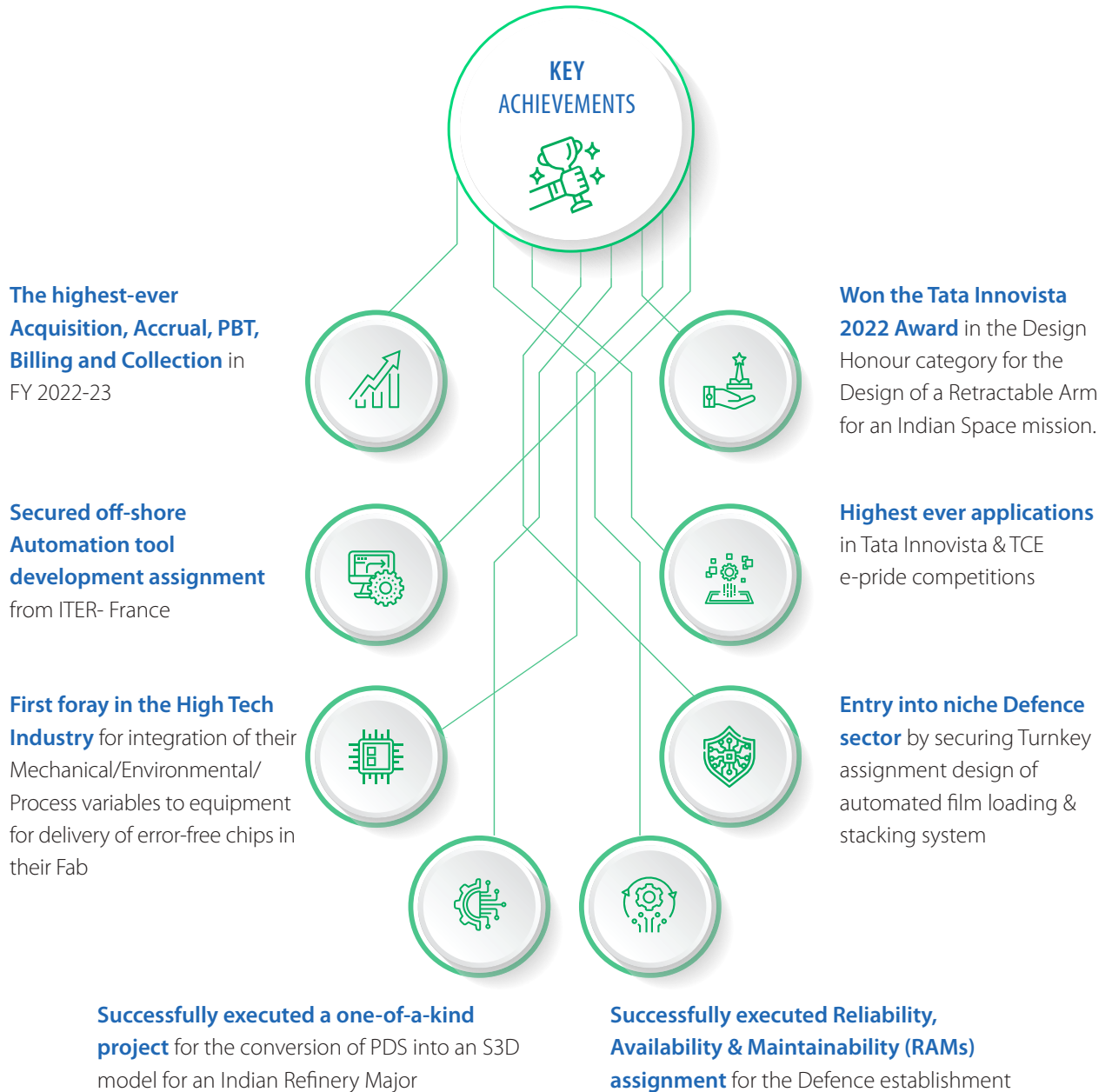
FE/CFD Analysis - Strong domain knowledge, offering Finite Element Analysis & Computational Fluid Dynamics (CFD) analytics services to help solve various analysis related challenges faced by industries during product development. Extensive experience in designing & developing Special Projects in areas of electromechanical, scientific establishments, Space and Nuclear Applications & Research organisations
- Turnkey Machine Development** - Delivered several robust, repeatable, safe and on-time electromechanical designs, helping create high quality and cost-effective machinery as per industry accepted product design & quality.

Machine Localisation - Executed several machine Localisation projects for adapting a product or machine to a specific local market to leverage cost advantages.

Machine Component Development - Expertise in designing and developing specific components/ assemblies/sub-assemblies/special tools/ Jigs & Fixtures/Handling arrangement for large components.
- Unified 3D Engineering, 4D, 5D Simulation (UES)** - UES provides end-to-end integration of discipline wise data into a detailed design environment with intelligent P&ID, Integrated 3D models & master tags. Multi-discipline teams can collaborate in real time & increase engineering efficiency.

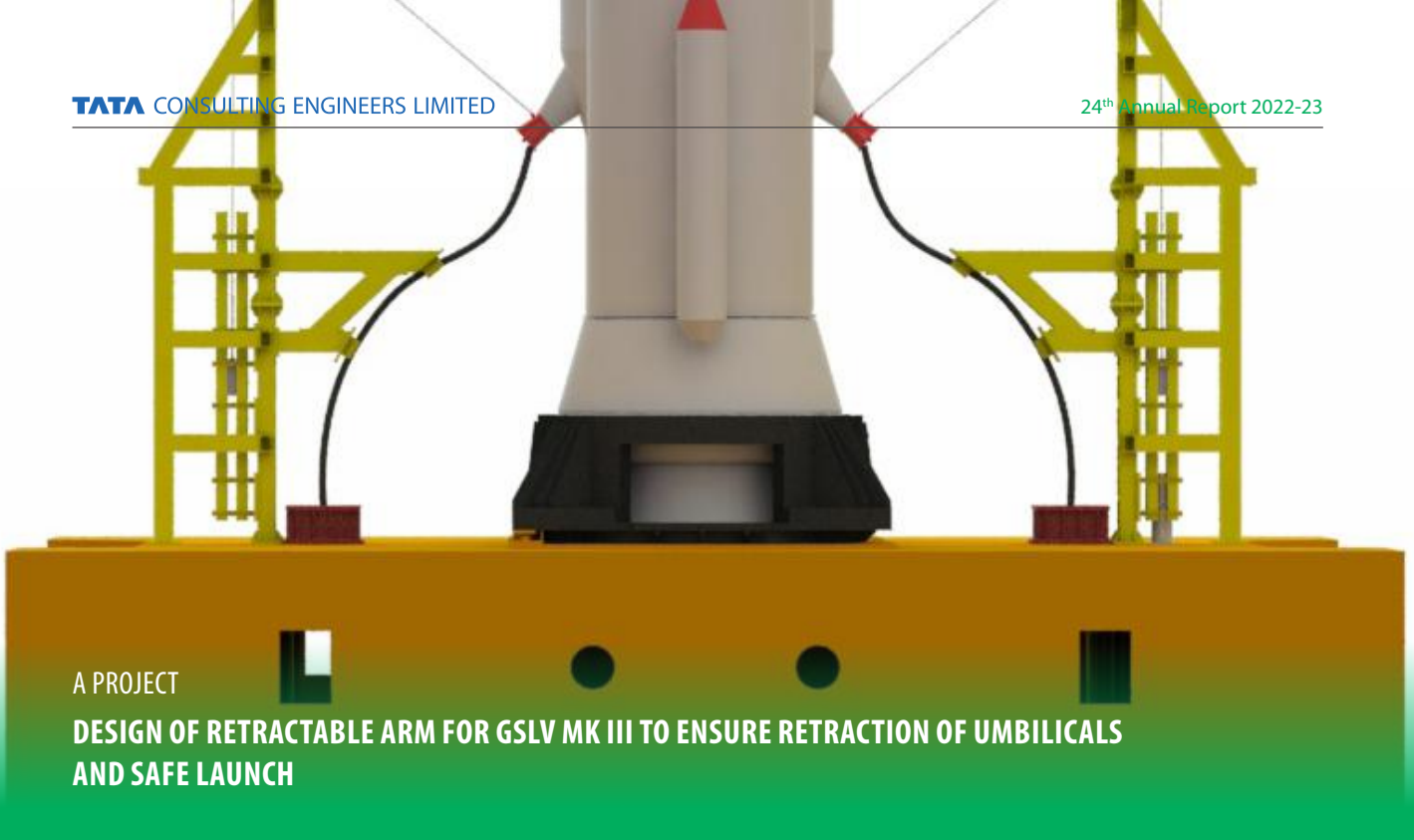
4D - Planning and Scheduling of the Construction Sequence will be simulated through tools to get the planned versus actual progress.
- Building Information Management (BIM)** - An intelligent 3D model-based process that provides architecture, engineering and construction (AEC) professionals with insights and tools to efficiently plan, design, construct and manage buildings and infrastructure.
- Asset Digitisation & Asset Information Management** - Enable digital transformation of plants using industry leading solutions (AVEVA, SIEMENS, HEXAGON) to assist owners and operators in digitising their engineering & plant information with a single version of the truth.
- Industry 4.0 & Asset Performance Management** - Drive measurable and immediate results with trusted APM solutions. Advance the enterprise and enhance asset availability with comprehensive APM solutions - Predictive Analytics, RCM, Unified Visualisation and Digital Workforce.

The Digital & Advanced Technologies Business Unit (DATBU) at Tata Consulting Engineers (TCE) was formed to spearhead the digitisation initiative of the Company by positioning itself as a cutting-edge advanced technology service provider. TCE is poised to deliver value by leveraging its 60 years of domain expertise and a dedicated pool of talented engineers.



KEY INITIATIVES THAT HELPED PROVIDE BENCHMARK RESULTS

- Standardised Delivery Processes across product lines
- Substantial Increase in Client Stickiness
- Development of partner ecosystem, ensuring on-time project delivery
- Leveraging the Atmanirbhar Bharat and Make in India initiatives to increase the footprint in Product Engineering
- Cross Training and Cross Skilling of resources for increased utilisation.



A PROJECT

DESIGN OF RETRACTABLE ARM FOR GSLV MK III TO ENSURE RETRACTION OF UMBILICALS AND SAFE LAUNCH

Umbilicals are a highly critical part of satellite launch vehicles (SLV). Various fluids, gases and power to the SLV are provided through the Umbilical Cord Unit (UCU) attached to the SLV till its Lift off. This one of its kind launch equipment with multiple functionalities was required to be developed for launching the GSLV Mk-III Vehicle.

A mechanism was required to be mounted on Mobile Launch Pedestal (MLP) to uncouple and retract Umbilicals along with the hoses, ensuring the satellite vehicle's safe launch. Retraction of Umbilicals had to be completed within 1.5 sec of the Satellite Vehicle Lift. Failure in timely retraction would cause the UCU to hit the Satellite Launch vehicle leading to a possible explosion.

TCE developed a robust, reliable and fail-proof solution for retracting the umbilicals. The design's most innovative aspect was using a limited counterweight mechanism to retract the UCU in a controlled manner to achieve retraction within 1.5 seconds from the launch. Complex kinematic and dynamic calculation tools were leveraged for this innovative design of the Retractable arm.

The system was designed without complicated drive elements ensuring a reliable and cost-effective system.

TCE also designed a high-strength hose support frame to ensure a controlled retraction to support the highly unpredictable hoses of the umbilical supply lines. The geometry was finalised as a result of extensive motion analysis and simulation.

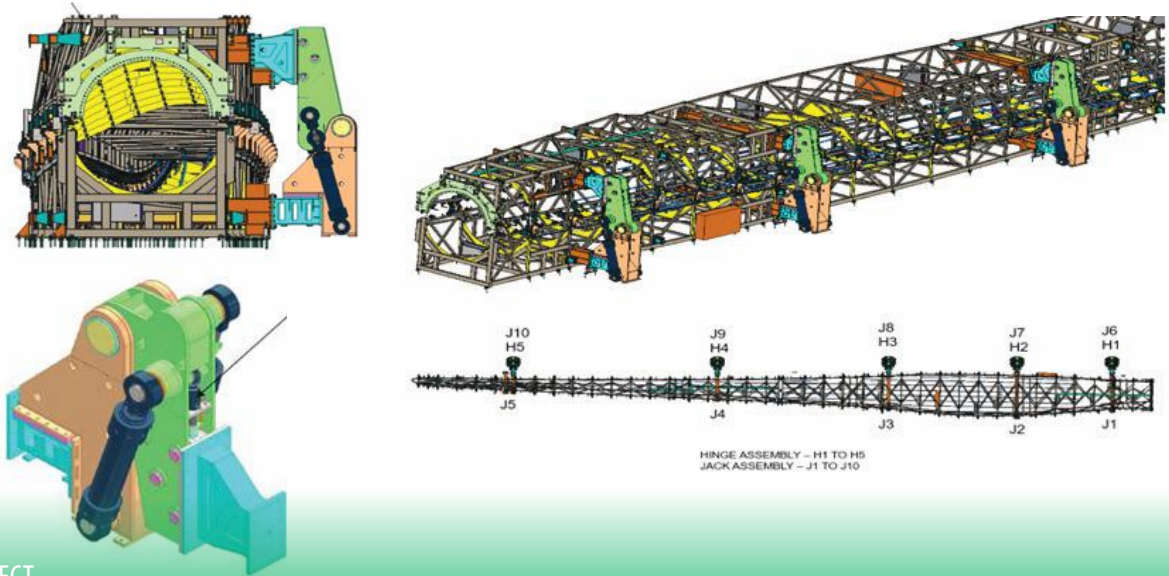
KEY CHALLENGES:



- Achieving the retraction of UCU in 1.5 seconds to a distance of 1.5 meters with the unpredictable nature of flexible hoses.
- The design of the system to withstand heavy jet loads and optimisation to reduce deflection of the MLP
- Developing the design for the first time without any reference designs.

IMPACT

- Safe launch of SLV with savings worth **370 Crores per launch.**



A PROJECT HYDRAULIC TURNING MECHANISM (HTM) – TURN KEY PROJECT

The project’s objective is to Design, Manufacture, Supply, Installation & Commissioning Indigenous Hydraulic Turning Mechanisms (HTM) for wind turbine blades. The design should increase the torque capacity of hinge assemblies up to 600 kNm by reducing the number of Hinge assemblies from 6 to 5.

TCE developed a robust, reliable and safe solution for rotating 75m long structures supporting wind turbine blade moulds. The design’s most innovative aspect was positioning hydraulic cylinders, hinge point to take advantage of lever arms, locking and stopper arrangement to achieve higher torque 600 kNm with five nos. of Hinges. Complex engineering calculations, Finite element analysis and dynamic calculations were carried out for this innovative design.

TCE also designed the hydraulic circuit and instrument interlocks to ensure a controlled and synchronised operation of all five hinges positioned at different locations along the length of a 75m long structure. The layout was finalised as a result of extensive simulations and overcoming space constraints at the site.

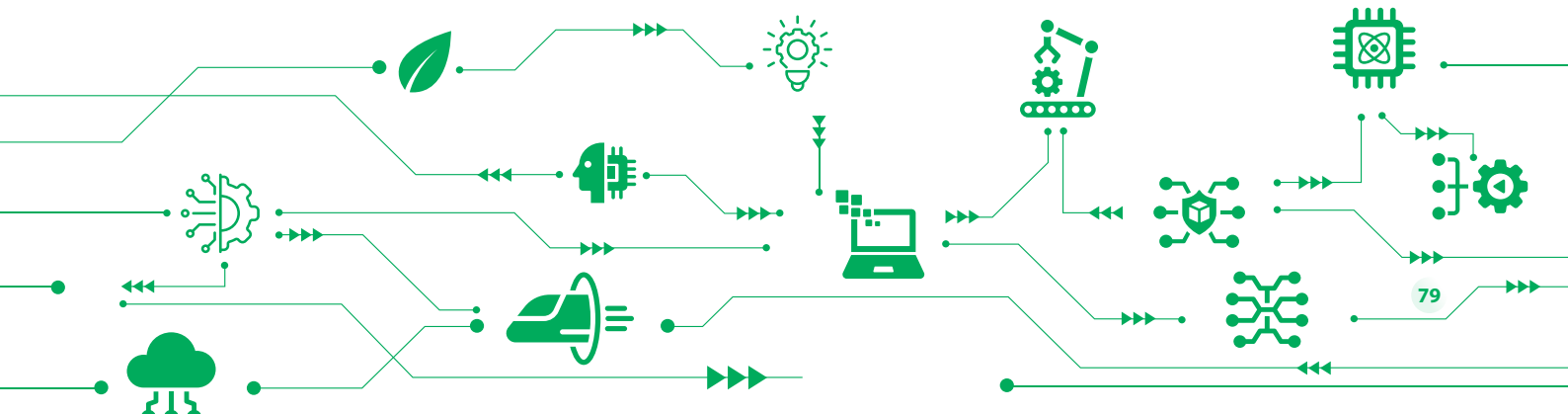
KEY CHALLENGES:



- Achieving higher rotation torque of 600 kNm with reduced no. of hinges (6 to 5).
- Space constraints, limitation of Hydraulic circuit and hydraulic cylinder sizing
- Developing the design for the first time without any reference designs.

IMPACT

- Indigenously developed design
- Savings worth **10 Crores per mould manufacturing due to low-cost design**



CORPORATE GOVERNANCE

Tata Consulting Engineers Limited (hereinafter referred to as 'TCE' or 'Company') has a strong legacy of following fair, transparent and ethical governance practices. The Board of Directors and the Management Committee comprising enlightened leaders, work together to drive the core values that form TCE's guiding philosophy that good governance is an essential element of business, which helps the Company fulfil its responsibilities to all its stakeholders. TCE's Corporate Governance traits include ethical business conduct, commitment to values and integrity, which enhance and retain stakeholders' trust. The Management Committee takes business decisions in consultation with the Board.

COMPANY'S PHILOSOPHY ON CORPORATE GOVERNANCE

Good Governance practices stem from the culture and the mindset of the organisation. Your Company considers fair and transparent Corporate Governance as one of its core management tenets.

TCE follows the best governance practices with the highest integrity, transparency and accountability.

Strong leadership and effective corporate governance practices have been the Company's hallmarks inherited from the Tata culture and ethos.

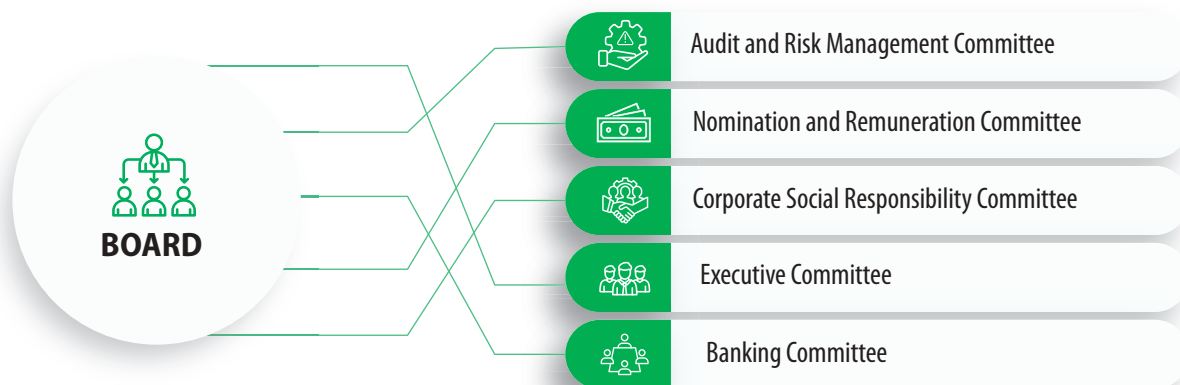
The Company has a strong legacy of fair, transparent and ethical governance practices. The Company has adopted a Code of Conduct for its employees, including the Managing Director.

In addition, the Company has adopted a Code of Conduct for its Non-Executive Directors.

As per Section 149 of the Companies Act 2013, the Company doesn't fall under the requirement of having an Independent Director on the Board or the Committees like the Audit & Risk Management Committee and Nomination & Remuneration Committee. Hence, the Code of Conduct for Independent Directors does not apply to the Company. However, the Company follows the Tata Board and Committee/s Governance Charter 2015 as amended from time to time & its applicable provisions. The Committees, i.e., Audit & Risk Management Committee, Nomination and Remuneration Committee.

Corporate Social Responsibility Committee, Executive Committee & Banking Committee are functional in TCE as a good corporate governance practice. The Company's corporate governance philosophy has been further strengthened through the Tata Business Excellence Model.

GOVERNANCE FRAMEWORK



BOARD OF DIRECTORS

As of March 31, 2023, the Company has 4 Directors. Of the 4 Directors, 3 (i. e. 75%) are Non-Executive Directors. The profile of the Directors is available on the Company's website (<https://www.tce.co.in/our-leadership/>). The Composition of the Board conforms with Section 149 of the Act. None of the Directors on the Board holds Directorship in more than ten public companies.

7 Board Meetings were held during the year and the gap between the two meetings did not exceed one hundred and twenty days. The dates on which the said meetings were held are given below:

Date of Board Meetings	Number of Directors Present at the Board Meeting	Total Number of Directors	Attendance (%)
April 22, 2022	4	4	100
June 24, 2022	4	4	100
July 22, 2022	4	4	100
September 07, 2022	4	4	100
November 08, 2022	4	4	100
February 02, 2023	4	4	100
February 06, 2023	4	4	100

The necessary quorum was present for all the meetings.

- The Directors have made necessary disclosures regarding Committee positions in other public companies as of March 31, 2023. None of the Directors are related to each other.
- The Board periodically reviews the compliance reports of all the laws applicable to the Company.
- Details of equity shares of the Company held by the Directors as of March 31, 2023: **Not Applicable**
- The names and categories of the Directors on the Board, their attendance at the Board Meetings held during the year under review and at the last Annual General Meeting ("AGM"), names of other listed entities/public companies in which the Director is a Director and the number of Directorships and Committee Chairmanships / Memberships held by them in other Public Limited Companies as of March 31, 2023, are given hereinbelow. Other Directorships do not include Directorships of private limited companies, foreign companies and companies registered under Section 8 of the Act. Further, none is a member of more than ten committees or Chairman of more than five committees across all the Public Companies in which they are a Director.

Name of the Director	Category	Number of Board Meetings attended during FY 2022-23	Whether participated at the last AGM held on July 05, 2022 (Yes/No)	Number of Directorships in Other Public Companies		Number of Committee positions held in other Public Companies		Directorship in other Listed Entity (Category of Directorship)
				Chairman	Member	Chairman	Member	
Mr Ashok Sethi (Chairman) (DIN 01741911)	Non-Independent, Non- Executive	7	Yes	0	4	-	6	-
Mr Amit Sharma (Managing Director & CEO) (DIN 03212568)	Non-Independent, Executive	7	Yes	1	1	-	-	-
Ms Anjali Kulkarni (Director) (DIN 06993867)	Non-Independent, Non- Executive	7	Yes	-	6	-	6	-
Mr Sriram Kadiyala (Director) (DIN 08449772)	Non-Independent, Non- Executive	7	Yes	-	-	-	-	-

- v. The Board has identified the following skills/expertise/ competencies fundamental for the effective functioning of the Company which are currently available with the Board:
- **Global Business:** Understanding global business dynamics across geographical markets, industry verticals and regulatory jurisdictions.
 - **Strategy and Planning:** Appreciation of long-term trends, strategic choices and experience in guiding and leading management teams to make decisions in uncertain environments.
 - **Governance:** Experience in developing governance practices, serving the best interests of all Stakeholders, maintaining Board and management accountability, building long-term effective stakeholder engagements and driving corporate ethics and values.

NOMINATION AND REMUNERATION COMMITTEE - OTHER DETAILS

Remuneration Policy

The Remuneration Policy of the Company is designed to create a high-performance culture. It enables the Company to attract, retain and motivate employees to achieve results. TCE's business model promotes customer-centricity and requires employee mobility to address project needs. In each country where the Company operates, the Remuneration structure is tailored to the regulations, practices and benchmarks prevalent in the industry.

The Company pays remuneration through salary, benefits, perquisites and allowances (fixed component) and commission (variable component) to its Managing Director and employees. Annual increments are recommended by the Nomination and Remuneration Committee within the salary scale approved by the Board and Members and are effective from April 1, each year.

The Board of Directors, on the recommendation of the Nomination and Remuneration Committee, decides the commission payable to the Managing Director and the Non-Executive Directors out of the profits for the financial year.

The commission is decided within the ceilings prescribed under the Act, based on the Board evaluation process considering the criteria such as the performance of the Company as well as that of the Managing Director and each Non-Executive Director.

The Company pays sitting fees of Rs. 40,000 per meeting to its Non-Executive Directors (Not in Tata employment) and Rs. 20,000 to its other Non-Executive Directors for attending Board meetings and committees meetings of the Board. The Company also determines to pay commission to the Non-Executive Directors within the ceiling of 1 per cent of the Company's net profits as computed under the Act's applicable provisions, with the members' approval.

The said commission is decided each year by the Board of Directors on the recommendation of the Nomination and Remuneration Committee and distributed amongst the Non-Executive Directors based on the Board evaluation process, considering criteria such as their attendance and contribution at the Board and Committee meetings, as well as the time spent on operational matters other than at meetings.

TCE follows the best governance practices with the highest integrity, transparency and accountability. Strong leadership and effective corporate governance practices have been the Company's hallmarks inherited from the Tata culture and ethos.

COMMITTEES OF THE BOARD

The details about various Board Committees as of March 31, 2023, which comprises the Statutory Committees as well, are as follows:

Name of the Committee	Extract of Terms of Reference	Category and Composition	Other Details
Corporate Social Responsibility Committee	<p>The Committee is constituted in line with the provisions of Section 135 of the Act.</p> <ul style="list-style-type: none"> Formulate and recommend to the Board a CSR Policy and CSR Annual Action Plan indicating the activities to be undertaken by the Company as specified in Schedule VII of the Act. Recommend the amount of the expenditure to be incurred on the activities mentioned in the CSR Policy. 	<p>Ms Anjali Kulkarni, Member Chairman</p> <p>Mr Ashok Sethi, Member Director</p> <p>Mr Amit Sharma, Member Director</p>	<p>During the year under review, the Company held 2 Corporate Social Responsibility Committee Meetings.</p>
Nomination & Remuneration Committee	<p>The Committee is constituted in line with the provisions of Section 178 of the Act.</p> <ul style="list-style-type: none"> Recommend to the Board the setup and composition of the Board and its committees. Recommend to the Board the appointment/re-appointment of Directors and Key Managerial Personnel. Support the Board and Independent Directors in evaluating the performance of the Board, its Committees and Individual Directors. Recommend the Remuneration Policy for Directors, Executive Team or Key Managerial Personnel and the rest of the employees to the Board. Oversee familiarisation programs for the Directors. 	<p>Mr Ashok Sethi Member Chairman</p> <p>Ms Anjali Kulkarni Member Director</p> <p>Mr Sriram Kadiyala Member Director</p>	<p>During the year under review, the Company held 5 Nomination and Remuneration Committee meetings as a good corporate governance practice.</p>
Audit & Risk Management Committee	<p>The Committee is constituted in line with the provisions of Section 177 of the Act.</p> <ul style="list-style-type: none"> Oversight of the financial reporting process. Reviewing with the management the Annual Financial Statements and Auditors' Report thereon before submission to the Board for approval. Evaluation of internal financial controls and Risk Management systems Recommendation for appointment, remuneration and terms of appointment of auditors of the Company. Approve policies in relation to the implementation of the Related Party Transactions. To consider matters with respect to the Tata Code of Conduct, Anti-Bribery and Anti-Corruption Policy and Gift Policy. 	<p>Mr Sriram Kadiyala, Member Chairman</p> <p>Mr Ashok Sethi, Member Director</p>	<p>During the year under review, the Company held 5 Audit & Risk Management Committee Meetings as a good corporate governance practice.</p>
Executive Committee	<p>The Executive Committee oversees the operational and strategic planning implementation reviews at the Business & Cluster Levels.</p> <p>Review and Achievements of Annual Business Plan.</p> <p>Review of Key Commercial Bidding Strategy.</p>	<p>Mr Ashok Sethi, Member Chairman</p> <p>Mr Amit Sharma, Member Director</p>	<p>During the year under review, the Company held 5 Executive Committee meetings.</p>

NUMBER OF BOARD & COMMITTEE MEETINGS HELD AND ATTENDANCE RECORD

Name of the Committee	Audit & Risk Management Committee	Nomination and Remuneration Committee	Board	Corporate Social Responsibility Committee	Executive Committee
No. of Meetings held	5	5	7	2	5
Date of Meetings	April 22, 2022 June 24, 2022 September 07, 2022 November 08, 2022 March 16, 2023	April 22, 2022 May 06, 2022 June 24, 2022 July 22, 2022 March 16, 2023	April 22, 2022 June 24, 2022 July 22, 2022 September 07, 2022 November 08, 2022 February 02, 2023 February 06, 2023	May 30, 2022 March 16, 2023	May 11, 2022 September 07, 2022 October 11, 2022 January 05, 2023 February 02, 2023
No. of Meetings Attended					
Mr Ashok Sethi	5	5	7	2	5
Mr Sriram Kadiyala	5	5	7	-	-
Ms Anjali Kulkarni	-	5	7	2	-
Mr Amit Sharma	-	-	7	2	5
Whether a quorum was present for all the Meetings			The necessary quorum was present for all the above Board & Committee Meetings		

GENERAL BODY MEETINGS

a. Annual General Meeting (AGM)

Financial Year	Date	Time	Venue
2019-20	Thursday, September 24, 2020	11.00 A M	Through Video Conferencing ("VC") / Other Audio-Visual Means ("OAVM"). Deemed Venue: Bombay House, 24 Homi Mody Street, Fort, Mumbai 400 001
2020-21	Friday, June 04, 2021	11.30 A M	Through Video Conferencing ("VC") / Other Audio-Visual Means ("OAVM"). Deemed Venue: Registered office, i.e., Matulya Centre 'A', 249, Senapati Bapat Marg, Lower Parel (West), Mumbai 400 013
2021-22	Tuesday, July 05, 2022	11.00 A M	Through Video Conferencing ("VC") / Other Audio-Visual Means ("OAVM"). Deemed Venue: Registered Office, i.e. Elphinstone Building, 10, Veer Nariman Road, Fort, Mumbai - 400 001

b. **Extraordinary General Meeting:** No Extraordinary General Meeting of the members was held during FY 2022-23.

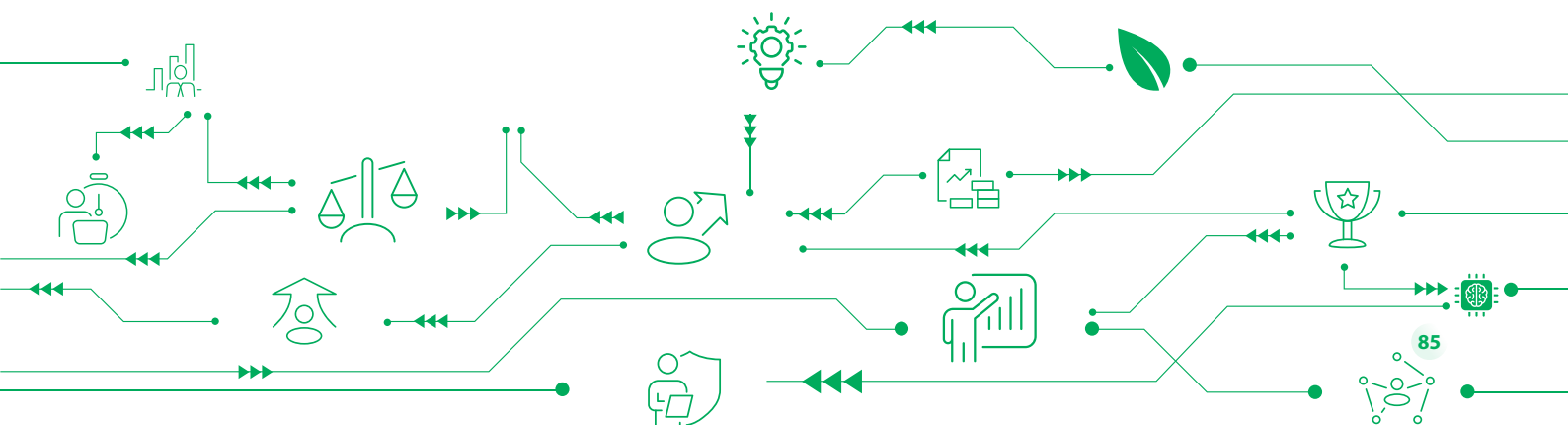
c. **Special Resolution(s) for FY 2022-23:** No Special Resolution for FY 2022-23

A certificate has been received from M/s Amrita Nautiyal & Associates, Practicing Company Secretaries, that none of the Directors on the Board of the Company has been debarred or disqualified from being appointed or continuing as Directors of companies by the Ministry of Corporate Affairs or any such statutory authority and Compliance of the relevant laws under the Companies Act 2013.

M/s B S R & Co. LLP Chartered Accountants (FRN 101248W/W-100022) have been re-appointed as the Company's Statutory Auditors as approved in the 23rd AGM, i.e., for five years block starting from FY 2022-23 till FY 2026-27. The particulars of payment of the Statutory Auditors' fee, on a consolidated basis, are given in the Statutory Section of the Annual Report.

OTHER DISCLOSURES

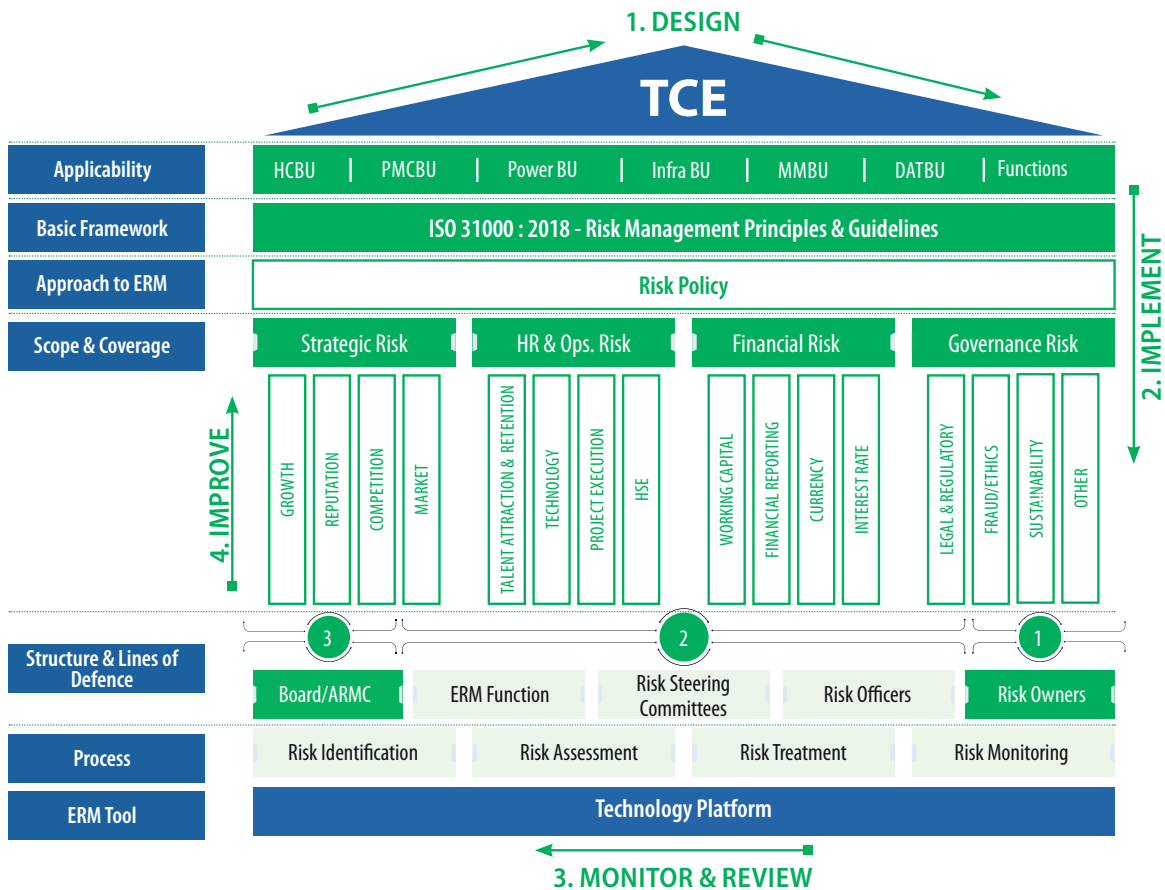
Particulars	Regulations	Details	Website Link for more information/ policy
Related Party Transactions	As defined under the Act	The details of the Related Party Transactions are provided in the Board Report forming part of the Statutory Section. Transactions entered into with related parties during the financial year were in the ordinary course of business and at an arms'length basis and were approved by the Audit and Risk Management Committee. The Board's approved policy for Related Party Transactions is uploaded on the website of the Company.	https://www.tce.co.in/corporate-governance/
Whistle Blower Policy and Vigil Mechanism	As per the Act	The Company has a Whistle Blower Policy and has established the necessary Vigil Mechanism for Directors and employees to report unethical behaviour concerns. No person has been denied access to the Chairman of the Audit & Risk Management Committee. The said policy has been uploaded on the website of the Company.	https://www.tce.co.in/corporate-governance/
Disclosure under the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2018	As per the Act	The details have been disclosed in the Board's Report forming part of the Statutory Section of the Annual Report.	




RISK RESILIENCE


Today the world is uncertain and is facing a CUVVI environment. CUVVI stands for Complex, Unpredictable, Vague, Volatile and Interlinked. Due to the complex environment, Companies across the globe need to be more prudent and continually alter their business models to adapt to such an environment to minimise the impact on the organisation's business goals. Companies will likely see increased complexity, shifting linkages and a multi-fold increase in their risk landscape. The complexity further increases for the organisations importing or exporting their goods/services or operating overseas. Many such scenarios need to be factored in by organisations while drawing their business plans. Organisations must identify and mitigate the risks they are exposed to. It may not be possible to eliminate the risks, but what matters is whether appropriate risk treatment measures are implemented to ensure the risk levels are within the risk appetite for achieving organisational objectives.


To reduce or mitigate the impact of potential risks (internal and external) on the Company's performance, Tata Consulting Engineers (TCE) has developed an Enterprise Risk Management (ERM) framework and process in line with the business value chain of the Company and best practice recommendations of standards like ISO 31000 and COSO framework. Risk scores, high-risk bids and projects and mitigation plans are some of the key parameters tracked. The Company's risk management procedure captures and evaluates risks throughout the project's lifecycle, i.e., from the bid stage till the closure of the project. The Risk Management System at the bid and execution stage captures and shares the risk data for bids and projects through various dashboards and reports to support risk reviews, risk mitigation and monitoring, risk reporting, etc.





MEASURES AND INITIATIVES TO DEAL WITH KEY RISKS INCLUDE


- 


A detailed review of bids based on threshold values at the bid stage and regular project reviews of key projects from each Business Unit (BU).
- 


Risk inputs to strategy covering business and sector-wise key updates both in terms of risks and opportunities.
- 


Risk challenge to the Annual Business Plan (ABP) based on the potential risks that may impact the ABP & likely impact in terms of optimistic, pessimistic and base scenarios.
- 


Portfolio analysis of sectors in a BU to understand the risk vs return potential of the sector within a particular BU.
- 

Revision of BU and Function risk registers.
- 

Country profiles are prepared and shared with BUs and the International Marketing Group (IMG), covering risks and opportunities for informed decision making.
- 

The Company is working on its Digital Risk Management approach to identify and reduce the impact of Digital Risks.
- 

Increased focus to strengthen risk culture in the organisation by training key stakeholders comprising BU Risk Officers, Business Development and Project Management Teams.
- 

Trained TCE employees using newly developed training modules – Claims Management, Risk Management system at bid and execution stage.
- 

The Risk Management team has also started offering its services to TCE clients.

All the above steps have helped strengthen the Company's Governance and Risk processes to aid decision making. The Enterprise Risk Management (ERM) team also presents to the Corporate Management Committee (CMC) and the Audit & Risk Management Committee (ARCM) of the Board periodically on the risk assessment and mitigation procedures adopted to enhance the effectiveness of the risk management process. TCE was awarded Masters of Risk – Real Estate and Infrastructure Sector - Mid-Cap Category at the CNBC-TV 18 India Risk Management Awards.

Risk Management Organisation: The Risk Function at the central level is primarily driven by Chief Risk Officer with guidance from the MD, COO and the Board. CRO is supported by the Corporate Risk team and Business Unit level Risk Officers (BUROs) in various initiatives related to risk management and integrating/deploying the risk frameworks in respective BUs.

KEY RISKS AREAS AND MITIGATION APPROACH

Risk Category	Key Risk Areas	Areas Impacted	Mitigation Strategies
Economic Risk	<ul style="list-style-type: none"> • Demand for Company's services is mainly capex based. Economic downturns, reductions in government or private spending and political & economic uncertainty may impact the Company's clients' sectors. • Uncertainties presented by the rise in inflation, Russia-Ukraine conflict and supply chain issues may impact project viability, delay the owner's capex plans, or hit their ability to make timely payments in existing projects. 	<ul style="list-style-type: none"> • Ability to generate new business, revenue targets, revenue out of existing business, make collections for current and past dues, project delays leading to cost increase, etc. 	<ul style="list-style-type: none"> • TCE has multiple Business Units (BU) across sectors making it less dependent on any single industry and enabling the Company to capture new opportunities. • Proper due diligence of clients, ensuring projects viability, funding tie-up etc., are in place.
Business Acquisition & Revenue Flow	<ul style="list-style-type: none"> • External factors like economic trends, wars, politics inflicted issues, policy changes, market conditions, geopolitical issues, pandemics etc., may impact the business acquisition. • Delays or reductions in new orders may affect the targeted revenues. • Revenue generation could also be negatively impacted due to internal issues like the inability to deploy the right workforce and inadequate planning. 	<ul style="list-style-type: none"> • Reduced jobs in hand. • Revenues, cashflows and profits. 	<ul style="list-style-type: none"> • Identify sectors/ geographies/business models for growth. • Develop new key accounts/customers & enter new areas through partnerships, etc. • Deepen customer connect.
Concentration Risk	<ul style="list-style-type: none"> • Dependency on certain key clients, types of business models, geographies or sectors may hurt revenues. • Despite good relationships and performance by TCE, client(s) may have to reduce, delay, or cancel their contracts due to changed business scenarios. 	<ul style="list-style-type: none"> • Volatility or fluctuations in business performance. • Inability to achieve acquisition, revenue, anticipated profitability/ operational targets in case over-dependent aspect gets impacted/ faces any issues. 	<ul style="list-style-type: none"> • Conscious efforts to reduce dependence or concentration on any single client, geography, or sector. • Develop newer key or large accounts. • Strengthen business relationships with clients at all levels.

Risk Category	Key Risk Areas	Areas Impacted	Mitigation Strategies
Loss of Confidential Information/Data Violation/Breach	<ul style="list-style-type: none"> Processes are being followed to correctly identify confidential information of the Company & other stakeholders and prevent leakage. However, there remains a risk of loss of confidential information. 	<ul style="list-style-type: none"> Loss of sensitive information. Negative impact on reputation and brand value. Loss of business. 	<ul style="list-style-type: none"> Training and sensitisation of employees. Obtaining specific NDAs / Confidentiality agreements from employees/partners. Tightening IT security measures.
Human Resources	<ul style="list-style-type: none"> Shortfall of key resources in case of high attrition in select BUs. Competition and the Company's ability to attract talent in current market conditions may be challenging. Unexpected incidents and risks like war, pandemic and climate risks may impact the Company's ability to deploy workforce at sites worldwide. 	<ul style="list-style-type: none"> Delay in deliverables/ projects. Reduction in revenue and profits. Increased workforce costs in case of any immediate hiring required for key positions. 	<ul style="list-style-type: none"> Enhancing employee engagement practices. Developing specific learning and re-skilling programs by providing adequate training. Proactive strategies to attract the right talent from various sources. Focus on providing a safe environment and ensuring employee well-being.
Locked Working Capital and Cash Flow	<ul style="list-style-type: none"> Many of the Company's contracts have milestone-based payment terms, so high costs may be incurred before billing and collection. Cash flows from projects can fluctuate significantly over the execution period depending on the delays, contingencies, etc. 	<ul style="list-style-type: none"> Impact on working capital & higher cost of financing. Negative cash flow. 	<ul style="list-style-type: none"> Enhanced focus on contract & claims management to ensure project delivery with profitability. Due diligence and factoring in locked capital or cash flow impact in the bid pricing.
Cost Overrun	<ul style="list-style-type: none"> Costs may increase in projects due to various reasons like: Higher quantum of resources required. Schedule delays. Resources being unoccupied while being deployed on the project. 	<ul style="list-style-type: none"> Lower profitability. Disputes with the client. 	<ul style="list-style-type: none"> Ensuring intense bid stage contractual review and study of primary/ secondary data to identify issues/risks, quantify the same and factor into the prices. Follow project and contract management best practices to avoid cost overruns.

Risk Category	Key Risk Areas	Areas Impacted	Mitigation Strategies
Liabilities	<ul style="list-style-type: none"> Company's project execution activities may result in liability as per Contract conditions. Force Majeure conditions being activated. Company could be exposed to monetary damages, claims or reputation risks due to deficiencies in service, any catastrophic event at the Company's project sites, etc. 	<ul style="list-style-type: none"> Unexpected costs to correct deficiencies. Negative impact on profitability. Increased litigations/ legal disputes. 	<ul style="list-style-type: none"> Adequate professional liability insurance at the organisational level. Proper due diligence during bidding to avoid taking up significant liabilities, adhering to contract requirements and professional best practices to avoid imposing penalties or liabilities.
Intellectual Property (IP)	<ul style="list-style-type: none"> Although the Company protects its intellectual property through contractual arrangements, registration, licensing, NDAs, etc., it may not be able to prevent infringement of IPs completely. Company's employees could inadvertently or purposely cause an infringement of the client's or third party's IP rights. Litigation to determine the scope of IP rights, even if ultimately successful, could prove costly. 	<ul style="list-style-type: none"> Unexpected and huge costs. Consumption of a significant amount of senior management's attention and time. Negative impact on reputation and brand value. 	<ul style="list-style-type: none"> Strengthen processes, contracts & other mechanisms to safeguard the Company's IP, confidential information & trade secrets. Provide training to employees on the importance of respecting the IPs of the Company and those of other stakeholders and the high price that the Company might become liable to pay in case of IP infringements.
Joint Ventures (JVs)/Partnerships	<ul style="list-style-type: none"> TCE works on certain contracts as a member of JV, in partnership and in similar arrangements. There is a risk that the Company's partners may be unable to fulfil their contractual obligations to the Company or clients. Company would have limited ability to control the actions of the JV partners, including non-performance, default, bankruptcy, or legal compliance. 	<ul style="list-style-type: none"> Impact on time and quality of project deliverables. Loss of revenue and profit. Increased litigations and hence loss of reputation. 	<ul style="list-style-type: none"> Proper due diligence of JV partner during the pre-bid/bid stage, esp. on financial ability, experience and track record. Strong back-to-back contractual arrangement to pass on liabilities and penalties to JV commensurate with their share in the partnership.

Risk Category	Key Risk Areas	Areas Impacted	Mitigation Strategies
Safety Risk	<ul style="list-style-type: none"> The Company may be exposed to safety issues if the quality is not adhered to/process is not followed while formulating the design and review of safety mechanisms during the project's construction phase as per contractual terms. 	<ul style="list-style-type: none"> Reputational impact. Injuries/loss of life. 	<ul style="list-style-type: none"> Stringent internal process checks by an independent team to ensure desired quality parameters are met. Training on safety aspects/processes to concerned employees to ensure safety.
International Operations	<ul style="list-style-type: none"> The Company's international operations pose additional risks and uncertainties, including unfavourable political developments and weak economies. E.g., unexpected changes in government policies, geopolitical issues, potential non-compliance with regulations and evolving industry standards, renegotiation or nullification of existing contracts, social, political and economic instability, currency fluctuations, etc. 	<ul style="list-style-type: none"> Loss of business. Safety and security risks of the personnel. Impact on revenue and profits. Impact on the global footprints of the Company. 	<ul style="list-style-type: none"> Perform and continuously maintain country risk analysis to identify new geographies as Go/No-go. Proper due diligence during bid time regarding country or location risk. Avoid excessively risky, unsafe, economically unstable, or vulnerable countries or geographies. Have systems and processes to ensure compliance with all key regulatory, govt and contractual compliances, standards, laws, etc.

To reduce or mitigate the impact of potential risks (internal and external) on the Company's performance, Tata Consulting Engineers (TCE) has developed an Enterprise Risk Management (ERM) framework and process in line with the business value chain of the Company and best practice recommendations of standards like ISO 31000 and COSO framework. Risk scores, high-risk bids and projects and mitigation plans are some of the key parameters tracked.

HUMAN CAPITAL

As a knowledge-led organisation, Tata Consulting Engineers (TCE) deeply values its people. At TCE, human capital is the powerhouse of its growth engine. The Company believes its people are its goodwill ambassadors that constantly create value for its customers and the communities in which TCE operates. Thus, prioritising employee well-being and building meaningful careers for its people is integral to TCE’s cultural DNA.

The Company recognises that its success as an organisation is inextricably linked to the success of its workforce and, as such, strives to provide a workplace environment that is challenging, rewarding and supportive. TCE is proud to be home to a diverse workforce from various ethnic, regional and cultural backgrounds. Its multi-generational workforce brings a rich blend of educational and professional experience.





RECRUITMENT

This year through continued dedicated efforts and strategic recruitment, the Company ramped up its workforce numbers through various sourcing channels such as campus recruitment, walk-in drives, social media campaigns, strategic partnerships in hiring, ex-pat onboarding etc. The workforce strength grew by 26%

- **Campus Recruitment:** TCE specialises in hiring young and fresh talent from a diverse cohort of college campuses and universities pan India. The Company has invested in a state-of-the-art, digitised campus recruitment program designed to identify candidates with the necessary skills and knowledge and demonstrate a passion for learning, problem-solving and teamwork. 363 Fresh Post-graduates and Graduate engineers were hired this year as a part of the campus recruitment program.
- **Re-Ignite-Return to Work** program empowers individuals to rejoin the workforce with a renewed opportunity post a career break.

As a knowledge-led organisation, Tata Consulting Engineers (TCE) deeply values its people. At TCE, human capital is the powerhouse of its growth engine. The Company believes its people are its goodwill ambassadors that constantly create value for its customers and the communities in which TCE operates. Thus, prioritising employee well-being and building meaningful careers for its people is integral to TCE's cultural DNA.



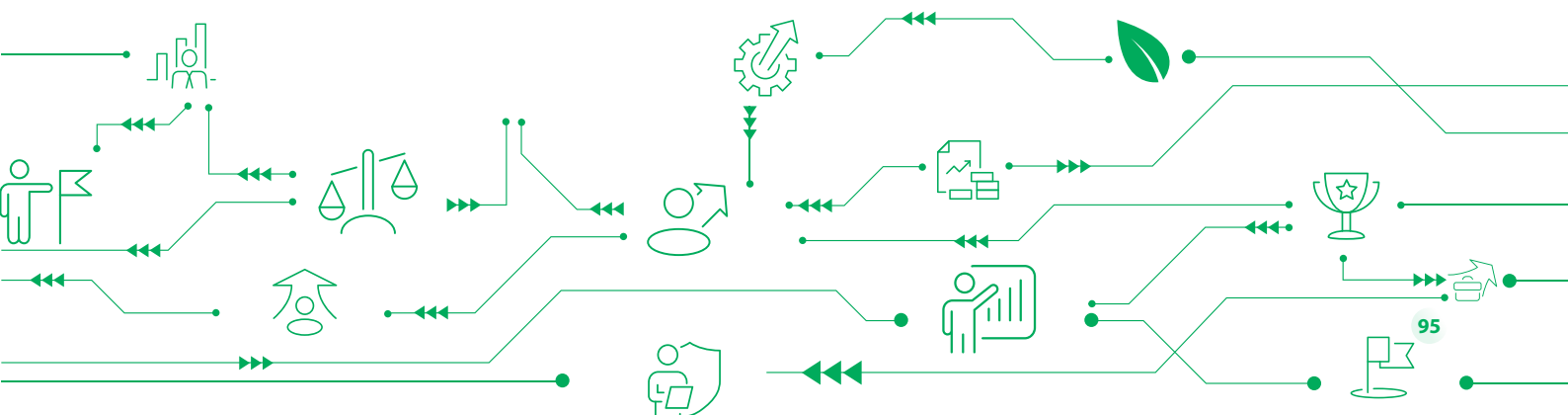
TRAINING AND DEVELOPMENT

- STAR:** This annual fast-track career acceleration program identifies and develops high-performing and high-potential talent across the organisation. Potential star talent is selected through rigorous evaluation, including Aptitude Assessment, Virtual Assessment Centre and Talent Council Interview. After selection, the employees undergo a 10-month intensive development journey tailored to their current role and career aspirations in TCE. As part of the development journey, the selected employees are taken through specialised programs in partnership with B-schools such as IIM-Kozhikode, IIM-Calcutta, IIT-Delhi, SP Jain Global, NMIMS, BITS-Pilani and academic partners such as Tata Management Training Center (TMTC).
- Young Engineers Development Program (YEDP):** TCE's marquee training program for campus freshers is recognised as one of the benchmark training programs in the industry. The comprehensive program is designed to develop the skills and expertise of young engineers and equip them with the knowledge and experience they need to excel in their careers. The program includes regular assessments and feedback to ensure the trainees meet the highest performance and professional standards. 363 young engineers trained this year.
- ADePT:** The program hosts many freshers onboarded and trained across various behavioural and technical training modules each year. This experiential campus-to-corporate journey is crafted to provide the trainee's hands-on experience in successfully understanding the complex business world and the bonuses and challenges that come with it. 147 employees trained this year.
- Leadership Excellence through Awareness and Practice (LEAP):** TCE's flagship leadership journey program for mid-senior employees, in partnership with ProventusHR, aims to empower the leaders with practical leadership tools and techniques. 360 feedback is captured for all team leads who undergo three editions of this program. This feedback creates a "Manager Score Card", showing how their team perceives them. Detailed action plans are made based on identified areas of improvement.
- SHINE:** In association with the Group HR, this program provides mentoring opportunities for young women leaders in TCE. The program offers practical insights on development based on career aspirations.



TRAINING AND DEVELOPMENT

- Learning Experience Platform (LXP):** This user-friendly platform provides accessibility to various courses, workshops and other learning resources available to employees at all levels of the organisation. Employees can access the LXP from anywhere and learn on the go, making it easy to take advantage of learning opportunities regardless of location or work schedule.
- ProMPT:** As a project-based organisation, project management is one of the core competencies at TCE. The third edition of ProMPT, TCE's internal project management certification program, was launched this year. The program was rolled out in an enriched format, allowing employees to choose their learning pathway via boot camps or self-paced learning journeys based on their interests and requirements.
- Qlik2Learn:** With this interactive virtual learning academy, TCE provides its employees with many learning opportunities from the comfort of their desks. This instructor-led training is based on employee learning needs and organisation goals.
- Learning Premier League (LPL):** One of the most successful learning initiatives, LPL is a yearly gamified virtual learning tournament to promote learning and engagement across the organisation. This year saw the highest participation from the employees from all business units and levels of the organisation, demonstrating their commitment to continuous learning and development.





EMPLOYEE ENGAGEMENT

TCE believes that individuals perform at their best when they feel cared for. TCE's employee-first policies provide a supportive and caring environment for its people to thrive at work.

- Employee Connect:** TCE's range of communication channels helps create a more inclusive workplace by accommodating diverse communication needs and preferences, promoting transparency and facilitating communication across different groups. Through Town Hall meetings, leadership connects, quarterly offsites, HR connect, HR open House and one-on-one conversations with team leads, the Company remains connected to its workforce and gains valuable insights into their needs and concerns. These efforts helped TCE whether the pandemic's challenges and strengthened its commitment to building a culture of openness and trust.
- Listening Mechanisms:** TCE has myriad listening posts and channels actively used to gather employee feedback. Whether implementing new policies, improving processes, or changing workplace culture, TCE is committed to using employee feedback as a guide to help improve continuously and evolve as an organisation. The Company strive to incorporate this feedback into its decision-making processes and takes actions to address concerns or issues raised. Employee Engagement Survey is another official mechanism of seeking feedback and input for improvement. Regular meetings with Employee Engagement Champions across various strategic business units are also held to monitor and drive progress.
- WellnessHQ:** These monthly wellness sessions help raise awareness of workplace well-being. Sessions range from expert help on mental health, work-life balance, financial Awareness, physical fitness, etc., in partnership with various external subject matter experts.
- Team Bonding Sessions:** Extensive opportunities are provided for the teams to bond and connect to enhance social well-being. Avenues include TCE Day, Sports Sessions and celebration of important days such as Engineer's Day, Founder's Day, Women's Day, etc.
- Crowdsourcing:** To encourage and promote a culture of ideation, innovation and independent thinking, TCE empowers its employees to share their ideas across forums like iThink, Reflexions, Problems Worth Solving, etc. The accepted ideas are recognised at various organisational forums.
- Rewards & Recognition:** TCE encourages a meritocracy culture. The organisation's recognition programs include annual awards like TCE Value Awards, e-PRIDE, Innovista and Long Service Awards and an instant prize called KUDOS recognising the efforts put in by employees during day-to-day work.

CAREER GROWTH OPPORTUNITIES

At TCE, career conversations are not a one-time event but an ongoing process. TCE encourages career conversations, allowing employees to discuss their goals, strengths and areas for improvement with their managers. Through these career conversations, employees can explore career development prospects, get feedback on their performance and plan their future in the organisation.

- PRISM:** TCE consciously works to enhance employee skills and provide them with career growth opportunities. The Company is committed to building a high-performance culture through its performance management system with clear performance standards, offering regular feedback and recognising and rewarding top performers.
- Internal Job Posting (IJP):** Aims to encourage skill development by providing job rotation opportunities across TCE.
- COMPASS:** TCE's competency framework and career architecture framework aims to provide employees with a glimpse of what their career progression could look like in TCE based on their aspirations and the organisation's vision. As part of Compass, a one-of-its-kind career fair was organised where employees could meet their career coaches (subject matter experts in their field) to discuss their career aspirations.



Among the Top 30 companies to be conferred with **Happiest Workplaces Awards, 2022**, for its initiatives towards employee well-being and employee happiness

Awarded Winner in Leading Practices in Learning & Development and Champion in Leading Practices in CSR at the **PeopleFirst HR Excellence Awards 2022**.

Best Leadership Transformation Award, **L&D Confex & Awards 2023** by Gainskills Media

Best Companies for Employee Well-Being, **World Happiness Congress Awards 2023**

Onboarding Programme of the year & Innovation in Learning Award - **11th L&D Leadership India Summit & Awards 2023**

ETHICS: LIVING THE CODE

TCE has a robust system of governance and operational controls in place to ensure the Company operates lawfully, ethically and responsibly. The Company has adopted the Tata Code of Conduct (TCoC), which encompasses ethics, transparency and accountability. TCoC articulates the Tata Group's values and ideals that guide and govern the conduct of the Group Companies and outlines the Company's commitment to each of its stakeholders, including the communities in which the Company operates.

27,897
PERSON-HOURS TRAINING
ON TCoC/POSH

"ADVANCED"
MATURITY ON ALL FOUR PILLARS
OF THE LBE FRAMEWORK

LEADERSHIP ENGAGEMENT

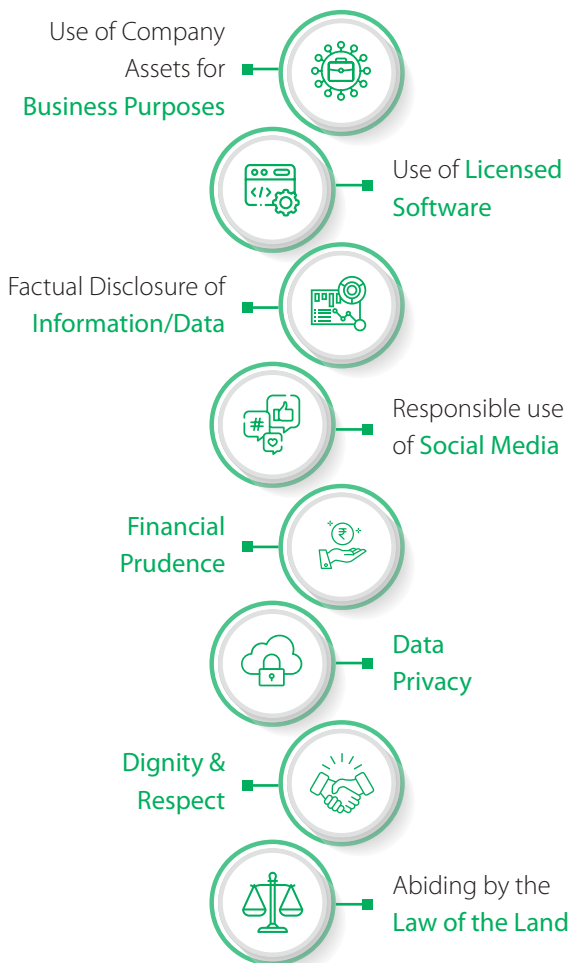
Ethical behaviour is intrinsic to the way TCE conducts its business. The Company complies with all regulatory laws and corporate governance guidelines and adopts global best practices.

Guided by the Tata Code of Conduct (TCoC), TCE has deployed the Leadership of Business Ethics (LBE) framework that reflects its commitment to shared values and principles.

The governance structure of TCE includes Location Ethics Counsellors (LECs), an Internal Committee (IC) for the Prevention of Sexual Harassment (POSH) and Ethics Flag Bearers.

The Chief Ethics Counsellor drives LBE initiatives and reports to the Managing Director & CEO, the Principal Ethics Officer (PEO).

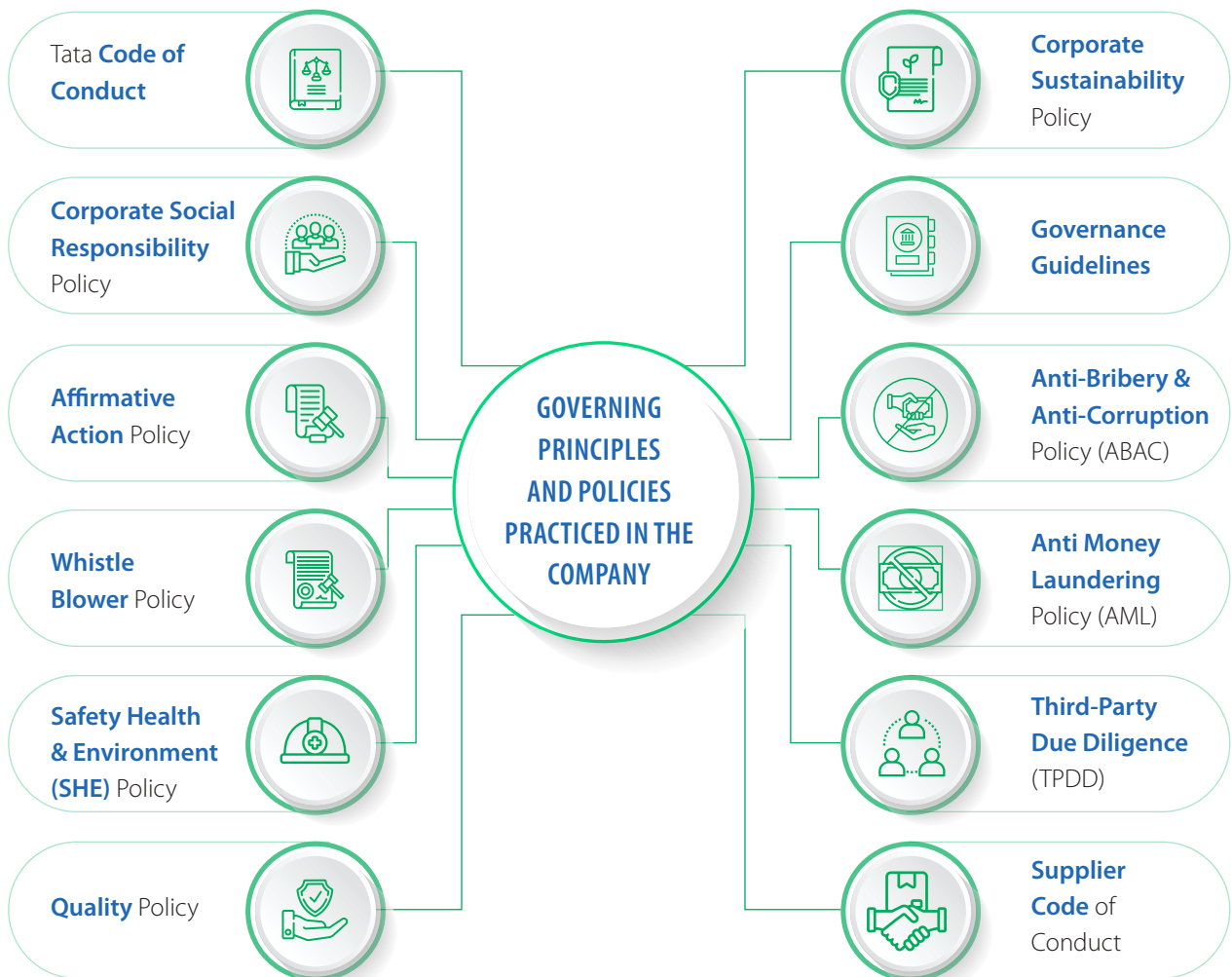
In FY 2022-23, the PEO communicated "Tenets of Ethical Conduct" with all internal stakeholders during the townhall meetings held across locations with a thrust on:



COMPLIANCE STRUCTURE

With Integrity and Trust as the pillars of the Company, it understands and recognises its impact on the larger ecosystem. The Company has well-thought-out, stringent practices and processes in place to ensure high standards of ethics and local compliance while delivering world-class projects to clients across the globe.

In line with the requirements of the Tata Code of Conduct, the Company has developed various internal policies that reinforce the Company's practices towards multiple stakeholders.



The above policies can be accessed at <https://www.tce.co.in/corporate-governance/>

An implementation framework is in place through focused classroom and web-based training. TCE has a full-fledged digital tool called "Ethos", which is available on TCE's intranet and serves as a one-stop solution for all ethics-related governance systems and processes.

MEASUREMENT OF EFFECTIVENESS

TCE has deployed the Leadership of Business Ethics (LBE) framework. LBE Index measures the effectiveness of the LBE Framework, Annual Compliance Report Maturity Rating, Self-assessment Quiz on TCoC/POSH/ABAC/AML/Gift & Hospitality/Whistle Blower Policy, Number of concerns received, % concerns resolved in stipulated time and benchmarking exercises with Group Companies. Ethics best practice publications under Leadership of Business Ethics on the Tata Edge platform are also referred to for process and policy benchmarking. The feedback received through LBE Survey/ACR and benchmarking data is incorporated into the annual plan for LBE deployment.

TCE participates in Annual Compliance Reporting, which entails an annual assessment of Tata companies for implementing the Leadership of Business Ethics framework. Tata Companies are rated on four maturity rating levels for each LBE framework pillar (Leadership, Compliance Structure, Communication & Training and Measurement of Effectiveness). In 2022, TCE attained an “Advanced” level of maturity rating on all four pillars of the LBE framework.

COMMUNICATION AND TRAINING

To reinforce TCoC and its related policies, a training and communication programme encompassing classroom and e-learning sessions has been implemented in delivery centres as well as domestic & overseas locations. These programmes are designed based on the target audience, such as the leadership team, employees, Consultants, third-party workforce and suppliers/ partners. E-learning training programs on TCoC, POSH, ABAC, AML, Whistle Blower & Gifts and hospitality policy are mandatory for all employees and stakeholders to refresh annually and submit a declaration of understanding.

In FY 2022-23, the Company conducted 27,897 person-hours training on TCoC/POSH and Compliance across stakeholder segments.

COMMUNICATION CAMPAIGNS



PREVENTION OF SEXUAL HARASSMENT (POSH) AT WORKPLACE

TCE believes that every employee should have the opportunity to work in an environment free from any conduct which can be considered Sexual Harassment. TCE has a gender-neutral POSH policy that protects all employees and stakeholders. The Company has formulated a policy on 'Prevention of Sexual Harassment' as per the provisions of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 and Rules, 2013. The policy applies to all TCE establishments located in India. The policy is available on the Company's intranet and has been widely disseminated.

TCE was recognised as one of India's Top 25 Safest Workplaces at the KelpHR PoSH Awards 2022. TCE was considered one of the most transformational workplaces in India for setting new benchmarks in the Prevention of Sexual Harassment at the Workplace (PoSH) in the areas as given below :

- POSH Legal Compliance
- Best Practices
- Active interest in the cause of Workplace Safety

850+ TCEites voluntarily participated in the survey, resulting in richer and more realistic feedback on TCE's culture being safe, compliant and inclusive.



TCE was among the Top 25 Safest Workplaces in India at the KelpHR POSH Awards 2022

TRANSPARENT AND ROBUST PROCESS FOR IDENTIFICATION AND EVALUATION OF SUPPLIERS

TCE engages with multiple third parties in India & abroad, like vendors, suppliers, or partners in an individual capacity or as an entity. It is crucial to safeguard TCE from ethical risks arising from these third parties. Such risks can range from project level to business or enterprise level. TCE developed and implemented a robust "Third-Party Due Diligence (TPDD)" process to safeguard the organisation from such risks.

The TPDD practice assesses, identifies and mitigates ethical and other compliance risks associated with third parties. TCE only engages with entities or individuals aligned with or ready to abide by its values and policies. TPDD process features have been recognised by the Internal Auditors (external party) and were appreciated as a Promising Practice by the Tata Group Ethics Office.

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CORPORATE SOCIAL RESPONSIBILITY

TCE believes in and supports inclusive economic development and the fundamental right to education. FY 2022-23 saw continued efforts of TCE in social upliftment and creating sustainable impact through its Corporate Social Responsibility (“CSR”) initiative “TCEndeavour”. The Company’s CSR projects included improving the quality of STEM education at the grass root level, skill development to close the opportunity gap and generate sustainable income and disaster recovery initiatives focused on reviving schools in impacted areas. As India’s leading Integrated Engineering Consultant, TCE leverages its core competencies to add value to CSR projects.

The CSR projects of TCE are aligned with the select SDGs of the United Nations. The various CSR initiatives are covered under the more prominent themes of Education, Sustainable Livelihood, Infrastructure Development and Healthcare. This year TCE decided to focus its efforts around three focus areas, i.e. Education, Infrastructure Development and Sustainable Livelihood.



EDUCATION



HEALTH & HYGIENE



INFRASTRUCTURE DEVELOPMENT



SUSTAINABLE LIVELIHOOD



LIVES TOUCHED
75917



LIVES TOUCHED
24024



LIVES TOUCHED
38260



LIVES TOUCHED
9680

TCEndeavour
CSR INITIATIVE OF TATA CONSULTING ENGINEERS LIMITED

AWARD AND RECOGNITION:



FICCI felicitated TCE under the **Special Category: Fight Against COVID-19** for combating the COVID efforts of the Company. For more information, please visit <https://www.tce.co.in/tce-combating-covid/>



Mr R Raghavan (Head, Power BU) received the **“Responsible Leader Award in Tata Sustainability Conclave”** for clocking 27 volunteering hours in Tata Volunteering Week



INFRASTRUCTURE

1760
SCHOOL CHILDREN

As an engineering consultancy serving the infrastructure sector, TCE responded to the call to rebuild schools destroyed during the natural calamity in Odisha and Hyderabad.

Cyclone Fani impacted Odisha in April 2019, whereas Hyderabad was affected by floods.

TCE helped seven primary schools rebuild the infrastructure by providing its engineering expertise in rebuilding disaster-affected schools with support from its partner organisations.

It also contributed towards the right to education of 1760 school children from Odisha and Hyderabad.



BALAPUR SCHOOL, HYDERABAD CONSTRUCTION WORK

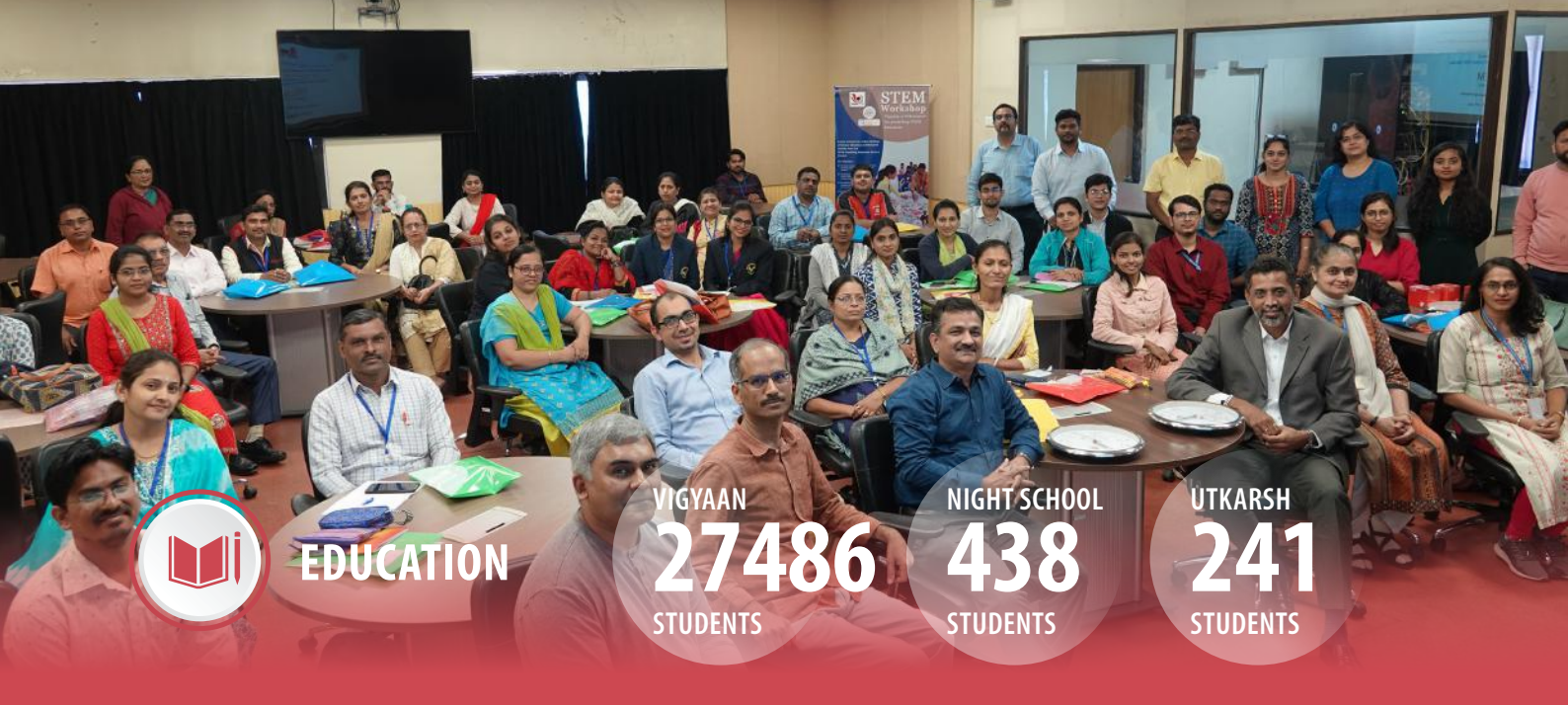


DEVARYANJAL SCHOOL CONSTRUCTION WORK

RESEARCH AND DEVELOPMENT IN PARTNERSHIP WITH SID AND IIT BOMBAY

The future of human existence hinges on its ability to mitigate the climate crisis. Innovation in green technologies is an essential vector for industrial decarbonisation and energy transition strategy. TCE is delivering its commitment to engage with the technologies of and for the future by extending its technical prowess and financial support to synergistic collaboration with research organisations in India.

Research and development projects are implemented under the infrastructure development focus area in partnership with the Society for Innovation and Development (SID), Bangalore and the Indian Institute of Technology Bombay (IIT Bombay). The CSR fund of TCE sponsors this initiative and the CTO team of TCE extends technical competency support. (more details available on Page 28)



1. VIGYAAN: Promoting STEM Education: Education is essential in building the nation. The new National Education Policy 2020 emphasises the development of the creative potential of teachers via experiential learning, including hands-on learning methods for the school curriculum. Considering this, TCE introduced a flagship project, Vigyaan, to improve Science, Technology, Engineering and Mathematics (STEM) education in underprivileged schools by training the teachers. TCE conducted seven STEM workshops for 216 teachers from 168 schools near TCE offices. These programs were conducted with the support of an expert implementation partner. Teachers were also provided STEM kits, which will help teach 27486 students.

Sixty-four volunteers from TCE also attended the STEM workshops along with teachers and visited the beneficiary schools contributing 1333 volunteering hours.

2. REMEDIAL SUPPORT TO NIGHT SCHOOL STUDENTS OF THE 10TH CLASS: Remedial support classes were conducted for students with difficulties in mathematics and English. 5 Centers were formed based on the locality of the schools and the students from Night schools were divided among these centres. Along with English and Mathematics, subject matter experts guided the students with easy techniques to tackle the exams. Four hundred thirty-eight students underwent the program.

3. UTKARSH: TCE leveraged its core competency and employee knowledge to train youth in AutoCAD and Revit and provided hands-on experience. With the support of the TCE partner organisation, the youth were mobilised and selected for the training based on socio-economic status and pre-assessment test of the subject domain. Utkarsh project was launched on Engineering Day, 15th Sept 2022.

The training programs were conducted across four TCE locations (Airoli, Noida, Bengaluru and Jamshedpur) by 54 TCE volunteers dedicating 1954 hours. The team also trained 35 youths in Mechanical, Civil and Electrical as a pilot project. A total of 241 youth were trained and 233 cleared the certification. The trainees also completed the Youth Development Model (YDM) program, an online 30 hours course to provide employability skills. YDM imparts skills (communication skills, soft skills, time management etc.) and attitudes required for effective and efficient job execution.





SUSTAINABLE LIVELIHOOD

80
HOUSEHOLDS

320
POPULATION

TCE continued to work with the communities in the hamlets of Dapti and Malghar in Jawahar, Palghar. In the past years, the Company's efforts in these communities helped create a sustainable source of livelihood by addressing water shortage issues post-monsoon season.

With the intervention of water ponds, farmers have started cultivating multiple crops. To supplement the water ponds with sustainable water availability throughout the year, TCE undertook the project to lift water from the perennial river source below the village.

The project was divided into 2-phases. The villagers launched 19km of excavation through Shramdan to lay the pipeline. The Solar lift benefits 80 households (320 population) by providing drinking water for farming and livestock rearing. Villagers have been trained in filtration techniques to make the water suitable for drinking.



SOLAR PANEL SUPPORT PROVIDED FOR WATER LIFT, JAWAHAR PALGHAR



THE WATER ROUTE

CORPORATE VOLUNTEERING INITIATIVES:

200
PROGRAMS CONDUCTED

15616
HOURS VOLUNTEERED

Corporate Volunteering is an essential pillar of CSR projects. TCE strongly believes in engaging its employees through volunteering initiatives linked to CSR projects and Tata Engage. Employees are encouraged to volunteer in different initiatives planned throughout the year. This year, along with CSR projects, volunteers participated in Tata Volunteering weeks 16 and 17 and ProEngage 18 and 19. Volunteering initiatives were also opened for the family members of the employees and retired workforce.

Three thousand one hundred twenty-three employees participated in various CSR initiatives and clocked 15616 hours.



CORPORATE INFORMATION

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Westlands Nairobi Kenya

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Engineering a Better Tomorrow™

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