TATA CONSULTING ENGINEERS LIMITED

UNBOUND

COLLABORATE. EVOLVE. LEAD.

18TH ANNUAL REPORT 2016-17

ABOUT THIS REPORT

This Annual Report is aimed at meeting the information requirement of all our stakeholders, including, investors, customers, suppliers, employees, contractors, competitors, press, analysts, Government and others.

Materiality

This Report includes information, which our top management believes, is material to our stakeholders and it presents an overview of our businesses and associated activities that help in short, medium and long-term value creation.

We have listed the material financial and non-financial issues for the Company and have presented information around our strategic approach towards these issues.

Scope of the Report

We have presented the information on all our Business Units, in a fair, balanced and understandable manner. To optimise the strategic overview, performance disclosures, governance oversight and risk management and control, the contents of this Report have been reviewed by our Senior Management. The information is reported for the period FY2016-17.

Reporting Principle

Through this Report, we have attempted to enhance our disclosures and have made efforts to align the communication with the Integrated Reporting (IR) framework by International Integrated Reporting Council (IIRC) and the Companies Act, (2013). The Report tries to communicate a clear, concise, integrated story that explains how all our resources are put together in creating value for the business and its stakeholders.

The key components of the Report have been aligned with the content elements of reporting defined in the IR Framework :

CORPORATE OVERVIEW

OUR GOVERNANCE

OUR STRATEGIC PERSPECTIVE & OUTLOOK

OUR BUSINESS MODEL & PERFORMANCE

How we create value using the six capitals

Financial Performance of TCE will be presented in Book-2, a separate publication.

UNBOUND

COLLABORATE. EVOLVE. LEAD.

A successful enterprise has to constantly evolve to lead from the front. Today, a business faces many challenges that are dynamic and interrelated. The fast pace at which new technologies are being adopted, global pressures for sustainable development and most of all, changing customer requirements are a reality today. These necessitate a coordinated approach to stay competitive. A deep re-evaluation of the business and a collaborative approach that enables unique value propositions is a must.

A collaborative approach drives diverse stakeholders to bring together complementing skills towards a common objective. Additionally, the integration of tangible and information-based resources helps achieve expected outcomes more efficiently. At Tata Consulting Engineers, we are cognizant of this and aim to utilise our expertise and innovative mindset to provide value to our customers. In the last fiscal, we collaborated with various partners to jointly deliver services in new geographies. We partnered with several marquee clients to address their unique needs through Dedicated Delivery Centres (DECs). Such collaborations have helped us evolve to develop new delivery and revenue models. Moving towards customised re-packaging of services and an eclectic mix of services related to the Capex and Opex spends of our customers, we are slowly but certainly emerging as leaders in the engineering services business, domestically and globally.

This strategy also called for robust internal re-engineering. We used design thinking principles to re-vamp processes for excellence in delivery mechanism. We have also strengthened our customer response systems, for better client insights. Our services through our various business units have also added value as lead consultants and as consortium partners enabling growth for the client's business and the overall economy across many geographies. We will continue our thrust to meet customers' needs and create sustained value for all our stakeholders.

Our Approach to Sustainable Stakeholder Value Creation:

- A strong vision of being an internationally respected engineering consultant offering comprehensive solutions
- Highly skilled and experienced management team, with extensive engineering, operational and regulatory expertise
- Rhythm 2.0 – An overarching initiative for Sales Excellence, Operational Excellence, Technology Excellence and People Excellence and an integrated delivery processes called WoW (Way of Working)
- Customised delivery model, focused region-specific strategy and agility in adapting to customer requirements in OPEX services
- Adoption of the very best digital technology for creating connected ecosystems
- Social and environmental benefits delivered through technology and management solutions, while meeting and exceeding regulatory requirement
- Order books showing a sustained growth of 9% over the previous year
- Orders in hand are around 2.4 times of last five-year turnover average
- Overall growth of 12.52% over the previous year and a five-fold increase in profits before tax over the previous year

ENGINEERING SOLUTIONS IN THE ERA OF THE INDUSTRIAL INTERNET OF THINGS (IIoT)

With an aim to provide engineering design consultancy for power sectors. Tata Consulting Engineers (TCE) was set up in 1962. Over the years, the Company has expanded into various other sectors to reach its current status of six Business Units (BUs) in diversified sectors. TCE serves domestic as well as international markets with a current share of international business in acquisition as well as accrual of around 42%.

The BUs operate from multiple locations called Delivery Centres (DCs). TCE has DCs at seven locations – Mumbai, Bengaluru, Kolkata, Jamshedpur, Delhi, Chennai and Pune. Each BU has a main location called Centre of Excellence (COE). TCE has also established Dedicated Engineering Centres (DEC) to address the unique needs of its premium customers.

Currently, TCE is executing projects (Design, Engineering and/or Site Services) at 130 sites across India and overseas. In the past, TCE was wholly dependent on large projects that were in the nature of capital investment projects, mostly coming from Government investments, large enterprises and those funded by international funding agencies. The cyclical nature of such businesses lead TCE to extend services beyond concept to commissioning and include asset life cycle management solutions. With increasing automation, and compliance requirements being imposed, TCE is geared to provide engineering services relevant to the Industry 4.0 era that include engineering services related to the Industrial Internet of Things (IIoT), asset upgrades and modernisation, digitisation of plant assets and other asset life cycle management solutions. In FY 2016-17, TCE entered into a collaborative agreement with Cassantec AG and Dattus Inc. to provide niche services in engineering for the IIoT. TCE's de-risked strategy drives a target of clinching at least 30% of total orders that are Opex in nature.

The Company made its first-ever acquisition in FY 2012-13, when it acquired Ecofirst–a sustainability consulting company. This subsidiary offers boutique services in the built environment space.

130

TCE EXECUTING PROJECTS AT 130 SITES ACROSS THE GLOBE

42%

OF REVENUES DERIVED FROM INTERNATIONAL BUSINESS

35.6 BN USD

WORTH OF PROJECTS UNDER MANAGEMENT (PUM)

VISION

To be an internationally respected engineering consultant offering comprehensive solutions

CORE VALUES

Customer Satisfaction and Loyalty | Employee Dignity and Self Respect | Technical Excellence with Professional Ethics | Organisational and Individual Growth | Responsibility to Society

MISSION

To provide technically excellent and innovative solutions for adding value for all Stakeholders, and operate globally as Professional Consulting Engineers

BUSINESS STRUCTURE

Business Units

Infrastructure

Key Sectors

- Water & Waste Management
- Built Environment
- Transportation

Energy

Key Sectors

- Thermal
- Transmission and Distribution
- Renewables
- Nuclear

Process

Key Segments

- Chemical
- Steel Mining & Metals

Service Segment

Project Management Consulting

- Project management & construction management solutions
- Safety solutions

Advanced Technologies

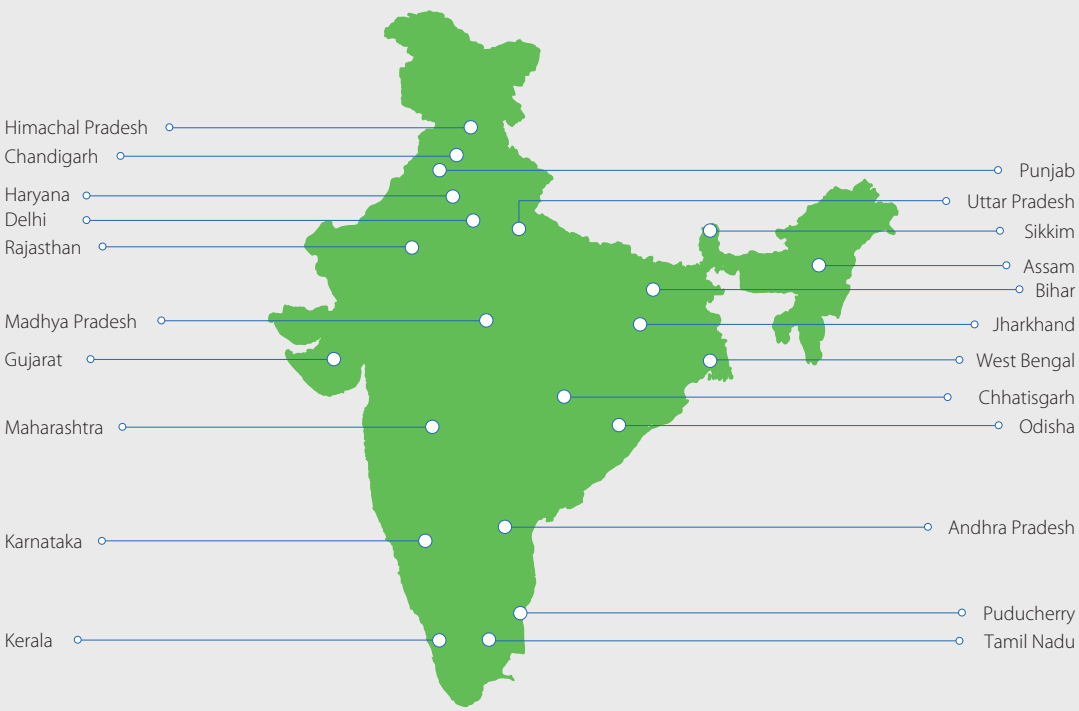
- Digital engineering
- Engineering solutions in IIoT
- Special projects in the applied engineering space

Our Expertise

	Service	Offerings Details	Delivery Mechanisms	Est. % of Revenue
A	**Engineering Studies**	■ Project Concept Development ■ Pre-feasibility and Feasibility Reports ■ Detailed Project Reports ■ Environmental Study Reports ■ System Studies	Through design and engineering teams based largely in various DCs or sometimes at project sites	50-54%
	Design Engineering Services	■ Basic Engineering up to RFQ preparation ■ Procurement support till vendor drawings & document review ■ Detailed Engineering including 3D modeling as per requirement ■ Inspection services ■ Assistance to Commissioning and Contract Closure		
B	**Project Management Consultancy & Construction Management Services**	■ Project management ■ Construction monitoring and control ■ Site supervision	Through teams based largely at project sites	33-36%
C	**OPEX**	■ Sustenance services with Dedicated Engineering Centres (DEC) - Annuity deals ■ Asset digitisation and management ■ Improvement services with asset life cycle management ■ Brownfield/capacity expansion ■ Retrofit for Emissions Control, Renovation & Modernisation/Rehabilitation ■ Plant betterment studies, Environment/ Emission/Energy Assessment studies ■ Outage management ■ Value Engineering solutions for Owners, OEMs, Utility Majors, DECs	Through dedicated teams operating in the on-site or off-site model depending on specific job requirements	13-15%

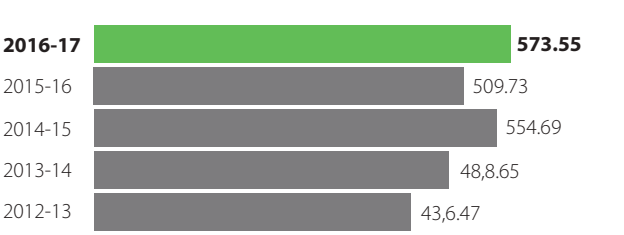
OUR REACH

Our Projects in India



TURNOVER

₹ in crore

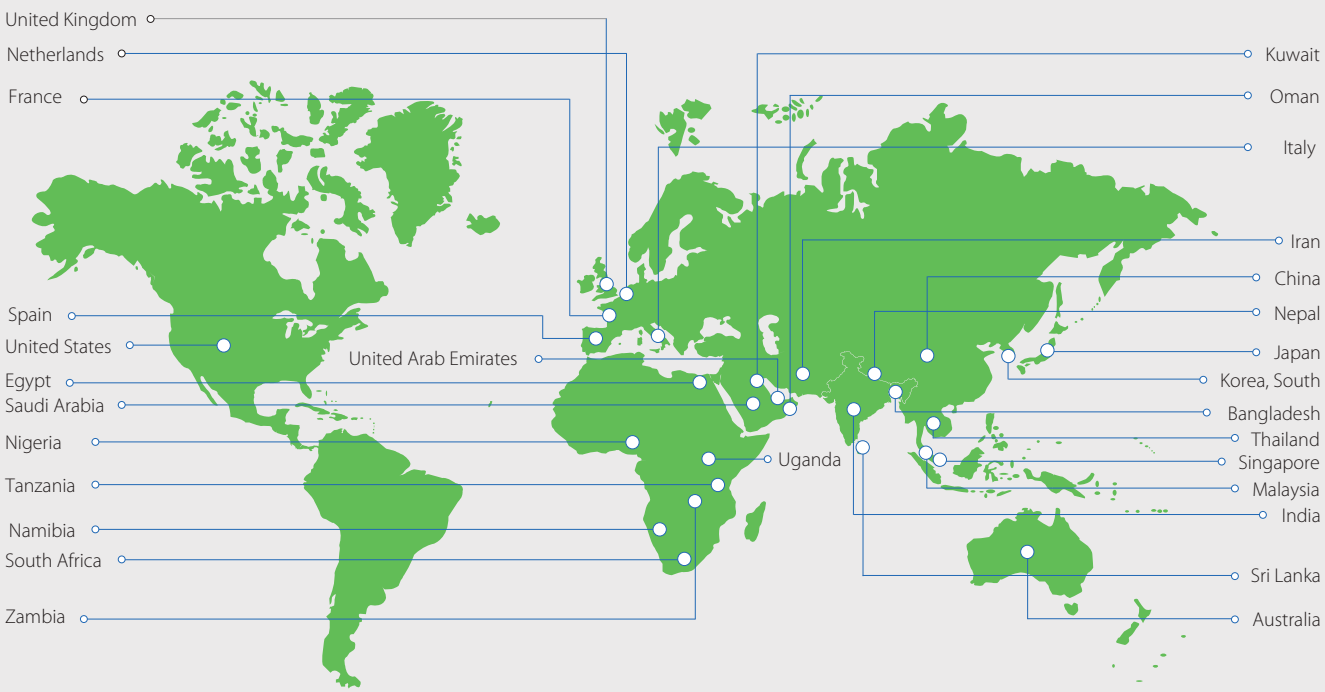


ABOUT

₹1,250crore

STRONG ORDER BOOK TO ENSURE BUSINESS SUSTAINABILITY

Our International Projects



Maps not to scale

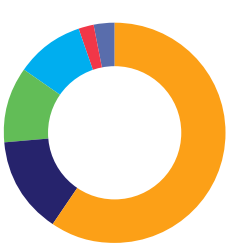
SEGMENTED REVENUE

(% of total turnover)

- Energy **25.1**
- Infrastructure **18.7**
- Steel, Metals and Mining **11.9**
- Chemicals **9.6**
- Advanced Technologies **0.4**
- PMC **34.3**

REGION-WISE SHARE IN REVENUE

(% of total revenue)



- India **59**
- Africa **14**
- SE Asia & Aus **11**
- ME **10**
- Europe **2**
- America **3**

CHAIRMAN'S MESSAGE

4.0

TCE 4.0 STRATEGY FOCUSES ON CUSTOMER CENTRICITY, COLLABORATION, CAPITAL MANAGEMENT

Dear Stakeholders,

The year gone by has faced several inflection points in the world of economics, geopolitics and technology. Tata Consulting Engineers (TCE), during this time, has sustained its growth, building on strong foundations. TCE posted the highest-ever turnover and the highest number of new order bookings. The management and Team TCE saw through a hard year with prudent decisions to curb costs and aggressive push to strengthen the order books. This combined with an agility to adapt to changing customer requirements brought in the benefits for TCE.

GROWTH & PROFITABILITY

In FY 2016-17, the Company completed the digitisation of finance, operations and engineering service delivery, adopting high-end digital application suites in engineering design, in line with the requirements of its customers. Strategic delivery models were adopted to suit unique customer requirements in various regions. Marquee clients reposited their faith in TCE resulting in the international operations posting 42% of revenue. In the domestic markets, the Company focused on large-scale projects, especially in the smart cities and infrastructure segment. The Company is a proud partner to modern India's development story, associated with about 25 Smart City and related projects in various capacities, several city redevelopment projects and water and waste management in key states. Focus on sales, both in the domestic and international markets yielded results. Domestic markets showed growth in Infrastructure, Water and Nuclear segments, while international markets yielded revenue in Steel, Power and Chemical segments. Thus, a balance of customised services for marquee clients in the international markets and prestigious, high-end projects in the domestic markets, sustained the top line growth for the Company.

Ecofirst Services Ltd., a 100% subsidiary of TCE, is making its mark with its consistent,

In FY 2016-17, the Company completed the digitisation of finance, operations and engineering service delivery, adopting high-end digital application suites in engineering design, in line with the requirements of its customers. Strategic delivery models were adopted to suit unique customer requirements in various regions.

40%

BOARD HAS REPRESENTATION OF 40% INDEPENDENT WOMEN DIRECTORS.

good performance. A boutique services consultant in the built environment space, Ecofirst now offers services like smart cities' planning, master planning, architecture, landscape and product mix plans for Greenfield development projects. The Company was instrumental in securing IGBC Platinum green rating for Bombay House, the Tata group headquarters. Bombay House is the first heritage building in India to acquire the IGBC green rating. Ecofirst posted healthy growth, with sales revenues exceeding 10% over the previous year. Going forward, the Company is poised to sustain its growth momentum with strong order books of prestigious projects for FY 2018.

In FY 2016-17, TCE posted gross revenues of ₹ 574 crores (USD 85.52 million). The Company took tough decisions to exercise prudence in operations, sustaining bottom line growth, with a five-fold increase in PBT over the previous year. TCE has stayed consistently profitable through the decades. This is on account of the Company's diverse sector capabilities and agility in adopting technological advancements.

CORPORATE GOVERNANCE

TCE adopted best practices in governance and diversity with a slew of measures. The board at TCE has a representation of 50% independent, women directors.
Mr. A. K. Vora, Director at the board retired w.e.f. 14th August, 2016. I join the management of TCE in thanking him for his tremendous contribution and also take this opportunity to welcome to the Board, Ms. Hema Ravichander, and Mr. P. K. Ghose as Independent Directors.

During FY 2016-17, the Board convened various meetings to deliberate on strategic initiatives by the Company. The Tata Code of Conduct was refreshed with greater thrust on training and awareness and the same has been adopted at TCE also. Codes and principles driving ethics, integrity, compliance and transparency were highlighted and campaigned across the organisation. Policies such as Anti-corruption, Anti-Bribery Anti-Corruptions (ABAC), Anti-money laundering, policy for gift and hospitality, etc. were introduced as the guiding principles for establishing integrity.

We continue to strengthen and build on TCE's strong foundation, driving robust governance standards. This Annual Report is an attempt at Integrated Reporting within the framework of the six Capitals with respect to Financial, Human, Social, Intellectual, Manufacturing and Natural. This will help TCE set the benchmarks in governance and best practices in operations.

CHAIRMAN'S MESSAGE (Contd.)

*Sustainable Development Goals

TCE directly contributes to drive:

TCE indirectly contributes to drive:

Risk and compliance involving operations were reviewed at the apex level, the audit committee, which convened periodically through the year. As per the risk assessment framework and policy implemented, risk scores and cases involving project risks were reviewed and action taken at the audit committee meets.

SUSTAINABILITY

Safety at the workplace, safety in design and safe practices in all project management consultancy services continued to take centre stage across TCE.

Workforce sustainability continues to be among our priorities with employee-friendly practices being adopted. Several initiatives were undertaken to retain more women at the workplace. The annual employee survey serves as the basis for some key initiatives introduced. TCE continued with the existing best practices in training and development of new graduate engineers and employees, more so, in the area of technical and digital delivery systems. Training in the softer aspects such as the TCE value systems and ethics were also driven using e-learning portals.

Corporate social responsibility programmes, especially the flagship programmes launched in 2015 advanced to the next phase. Focusing on the four core areas of Education, Infrastructure, Health and Sustainable livelihood, the programmes touched various stakeholder segments — young children, young adults and adults in rural areas. With the successful run of the various CSR programmes, TCE leveraged social capital by improving the lives of beneficiaries belonging to the marginalised sections of the society. TCE directly contributed to drive the Sustainable Development Goals* – 1, 4, 6 and 8 through various social initiatives in a meaningful way.

By providing engineering solutions to its customers, TCE also helped drive Sustainable Development Goals 11, 13 and 9 indirectly, in the regular course of business.

FUTURE PERSPECTIVE

Tata Consulting Engineers looks towards a positive future on the strength of the TCE 4.0 strategy. The TCE 4.0 strategy is based on three pillars – Customer Centricity, Collaboration, Capital Management. In line with the trends towards automation and the Industrial Internet of Things shaping current Industry 4.0 trends which the Company's strategy is aligned to, TCE's operations will go beyond concept to commissioning, to include OPEX services in asset life cycle management.

In line with the trends towards automation and IIoT, Industry 4.0 evolution, TCE's operations will go beyond concept to commissioning, to include Opex services in asset life cycle management.

25

ASSOCIATED WITH ABOUT 25 SMART CITY PROJECTS IN VARIOUS CAPACITIES

Customer Centricity

Create value to capture niche markets directed by customer requirements

TCE will build its business model in customer-driven markets complemented by service portfolios, delivery models and technology requirements specific to segments and geographies. This will ensure top-line growth even in a cyclical capital investment scenario.

Collaboration

Expand and scale up collaborations with consortium partners in the value chain

The focus will be to scale up and grow through a consortium-based approach driven by partnerships and agreements with consortium partners for organic expansion.

Capital Management

Build efficiencies in working capital and human capital management for a robust bottom line

TCE will ensure consistent top line and bottom line growth through efficiencies in working capital management and resource optimisation.

TCE has an eclectic mix of specialised talent within its workforce that will help the Company achieve its stated targets. Going forward, there will be a focus on diversity, employee engagement and building a strong culture that will help TCE transition to a truly global organisation. TCE's engineers are the agents of change, as they design and plan solutions that are sustainable and provide counsel to clients to adopt green solutions. I am happy to say that employees at TCE have taken on this responsibility and future success remains in building a sustainable and inclusive future for TCE and the communities it operates in. I thank our employees for their commitment to the success of TCE. I thank our Promoters, customers and partners for the trust they have reposed in us and look forward to their continued patronage. Through our extended service portfolio and value engineering solutions we hope to work closely with our customers for engineering an environment-friendly future.

Sincerely yours,
S. Padmanabhan

MANAGING DIRECTOR'S REVIEW

42%

INTERNATIONAL ORDERS ACCOUNTED FOR ABOUT 42% OF THE TOTAL ORDER VALUE

Dear Stakeholders,

A ROAD WELL-TRAVERSED

A journey of 54 years can never be a straight one. The diverse twists and turns have enriched Tata Consulting Engineers' (TCE) experience, making us strong and resilient. This strength comes from our strong inner core – technical competence that has depth and diversity, and responsiveness to customer needs. The legacy of TCE built by generations of visionaries, innovators and pioneers continues to evolve and innovate. Our growth story will continue to be based on these fundamentals and we will continue to innovate and refine our offerings and strategies in response to the market and customer demands. Having said that we are at the forefront of disruptive changes brought about by Industry 4.0. We are taking the lead by working on smart plants, smart cities, automation and smart asset digitisation.

STRATEGY & FOCUS

TCE's Industry 4.0 readiness is the crux of our growth plan for the next five years. The TCE 4.0 strategy is based on three core themes:

1. **Customer Centricity**
   Create value to capture niche markets directed by customer requirements

2. **Collaboration**
   Expand and scale up collaborations with consortium partners in the value chain

3. **Capital Management**
   Build efficiencies in working capital and human capital management for a robust bottom line

STRATEGY ROAD MAP

The 3 C's set the context for our business model. Rhythm, a business transformation exercise introduced in 2012 set the

We are at the forefront of disruptive change brought by Industry 4.0. We are taking the lead by working on smart plants, smart cities, automation and smart asset digitisation.

2.4 times

5-YEAR AVERAGE ANNUAL TURNOVER EQUIVALENT ORDERS IN HAND

operational path to push our growth agenda. Rhythm 2012-2016 focused on five key levers to refine our operations, enhance our international footprints, adopt digital engineering tool sets in both our operations and projects, re-engineer processes, and institutionalise our way of working across delivery centres.

In FY 2016-17 we launched Rhythm 2.0 to translate TCE 4.0 strategy into an actionable plan. Rhythm 2.0, our transformation programme is based on three levers - Sales Excellence, Delivery Excellence and Technology Excellence. Within each of these levers, TCE set the road map for each specific sector.

The growth strategy for FY 2016-17 was to leverage both CAPEX and OPEX spends of clients. The rationale being that client investments in CAPEX spends are cyclical in nature. In stressed macroeconomic conditions, capital projects demand falls and hence impacts the engineering consulting business. At these times, clients typically focus on asset sweating. In a competitive environment, clients also seek cost efficiency in operations, upgrades required to honour regulatory commitments, technology upgrades for enhanced productivity and increased automation to reduce costs. Thus OPEX related services offered a compelling window of opportunity for the consulting business, and TCE was able to offer its expertise in this area. With Industry 4.0 and the macroeconomic situation, OPEX will see much stronger focus in the coming years. We are already witnessing this in our ongoing assignments, both in the public and private sectors.

While owners focused on asset sweating, equipment manufacturers especially in Power, Chemical and Steel sector spent efforts in modularisation and standardisation of their products to ensure their competitiveness. TCE leveraging its expertise in plant engineering, plant process flow and 3D-4D skill set, was able to offer solutions around plant modularisation, construction simulation and skid based solutions.

Infrastructure spend in India with focus on smart cities, water management, master planning and urban transportation is on a high, and we benefited by winning few of these assignments, and will continue to build on this momentum.

Thus a balance of CAPEX and OPEX related projects from clients ensured a continuous flow of revenues even in an economy characterised by sluggish demand conditions.

Increasing automation of assets throws an opportunity in the Industrial Internet of Things that require a combination of engineering expertise, digitisation

MANAGING DIRECTOR'S REVIEW (Contd.)

expertise and asset management solutions. Responding to this scenario, TCE increased the scope of its business model to extend beyond concept to commissioning of projects and included asset life cycle management solutions. TCE entered into partnerships with technology firms to enhance its portfolio of services in Engineering Big Data analysis and IIoT for predictive systems for asset life cycle management.

OPERATIONS ROAD MAP

Sales Excellence

- Focused on annuity, repeat and OPEX based business to mitigate risks associated with slowing CAPEX investments
- Enhanced sales efforts via consortium, partnership and joint 'go-to-market' approach with OEM, EPC and Consulting/Design players
- Adopted sales focus specific to each geography and customer need

Delivery Excellence

- Focused on delivering value to our clients around plant optimisation, quality and value engineering
- Equipping workforce to adopt latest IT engineering suites and 3D-4D technologies enabling better planning, predictability and accuracy of our designs early in the project life cycle
- Internal IT systems for greater efficiency and accuracy
- Increased workforce mobility, established dedicated delivery centres, created skilled talent pool to serve as dedicated engineering arm of marquee clients

Technology Excellence:

- Adopted latest innovations in respective business streams to enhance customer relationships and outcome-based value propositions. Such innovations were offshoots on value additions within project delivery
- Ramped up existing knowledge management IT systems to capture and share domain knowledge internally with a view to improve productivity
- Encouraged technical talent to develop knowledge papers and reports to capture tacit domain knowledge within the organisation

TCE had also initiated a process re-engineering exercise branded as WoW -Way of Working. Applying design thinking, cross sections of employees brainstormed to arrive at process improvements which are currently being implemented.

OVERVIEW OF OPERATIONS

The year 2016-17 was a concerted effort to ensure top-line and bottom line growth. The various measures that we took paid off with TCE posting overall growth of 12.52% over the previous year and a five-fold increase in profits before tax over the previous year. The order books showed a sustained growth of 9% over the previous year. International orders rose 9.33% over the previous year accounting for about 42% of the total order value. Our customised delivery model, focused region-specific strategy and agility in adapting to customer requirements in OPEX services ensured a good top line growth and healthy order books. The improved performance in bottom line is attributed to optimal cost allocation, reigning in of cost of operations and better utilisation of human capital.

In the international markets, protectionist regulatory measures across most of the international markets, a move away from thermal power to renewable energy generation, volatility in the Middle East slowed down prospects in the Energy, Chemical and Steel Metal & Mining sectors. TCE overcame these challenges by leveraging existing relationships in Africa and providing niche services in Middle East and Western markets. The domestic markets showed promise in the urban infrastructure, water and waste, and nuclear energy sectors. TCE is a key player in several Smart City projects in the country working on a consortium model to win the bids. While these are prestigious projects, the competitive bidding based price points are a challenge to bottomline. To overcome this, the various businesses adopted project management systems and tools for project and optimal cost management. The Project Management and Construction business sustained high growth. The introduction of digital

RHYTHM 2.0	Customer	Collaboration	Capital
Sales	■ Retain market leadership in key sectors in domestic markets	■ Consortiums, partnerships and joint bids ■ Win complex and large deals ■ Penetration in focused geographies internationally	■ Focus on key financial metrics to ensure healthy working capital and cash flow
Delivery	■ Delivery excellence, based on customer centricity quality and focus on value engineering ■ Build long-term relationships through delivery excellence	■ Leverage existing capabilities in handling complex and multi-pronged projects	■ Enhance human capital focus an build a creative and engaged workforce ■ Optimise working capital management ■ Ensure bottom line focus with IT systems and tools for ensuring cost efficient delivery systems
Technology	■ Enhance customer connects and focus on innovative solutions to meet their unique demands and needs	■ Collaborate in key technology areas for adding value to client process and offer end-to-end services to client needs	■ Train and engage workforce in emerging technologies relevant to services various stages in asset life cycle

simulation tools and predictive scenario planning ensured cost optimisation of the construction process and TCE is a first mover to bring value. Going forward, TCE hopes to create more value to customers in the digital engineering and industrial internet of things as more customers move towards smart plant technologies.

TCE upholds its commitment to Social Capital by driving several corporate social responsibility programmes to improve the life of the marginalised sections of society. From a Human Capital perspective, TCE will continue to develop an agile, creative and energetic workplace, nurturing a technology savvy work environment updated with new developments.

We at TCE are happy to be on the brink of a new technological evolution and will endeavour to keep our tech talent abreast to provide state-of-the-art services to customers.

Sincerely yours,
Amit Sharma

BOARD OF DIRECTORS

Mr. S Padmanabhan
Chairman

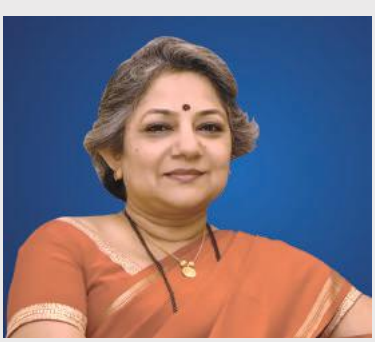
Expertise
Expert in IT, Engineering, Power, HR and Corporate Governance

Mr. P K Ghose
Director

Expertise
Expert in Accounting, Finance, M & A

Ms. Neera Saggi
Director

Expertise
Expert in Infrastructure, Water, Ports and Projects



Ms. Hema Ravichandar
Director

Expertise
Strategic HR Advisor

Mr. Amit Sharma
Managing Director

Expertise
Expert in Engineering Consultancy and Automation

EXECUTIVE MANAGEMENT

Sachin Dewasthalee
Chief Financial Officer

Kalpana Jaishankar
Human Resources

Mahesh Marve
Chief Technology Officer

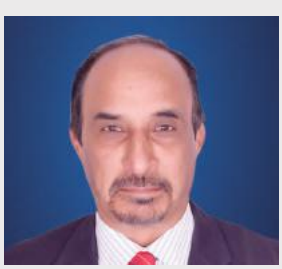
Sachin Mishra
Legal & Company Secretary

S Vidyanand
Energy Business Unit

Manoj Kumar
Chemical Busines Unit

Dr. Tapan Choudhury
Steel, Metals & Mining

Vikram Bapat
Infrastructure

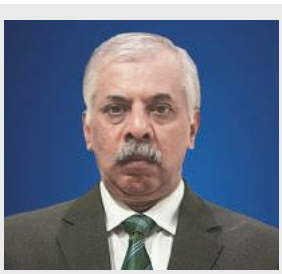


K Ramesh
Project Management Consultancy (BU)

Rajat Kaushal
International Marketing Group (RoW)

Pradeep Dhal
International Marketing Group (MENA)

P R Shahu
Advanced Technologies & IT



Shrikant Chandratreya
Business Excellence

Subsidiary

ECOFIRST SERVICES LTD.

Board of Directores

S Padmanabhan, Chairman
Amit Sharma, Director
Risheshwar Prasad, Director
K Ramesh, Director
S Vidyanand, Director

Executive Management

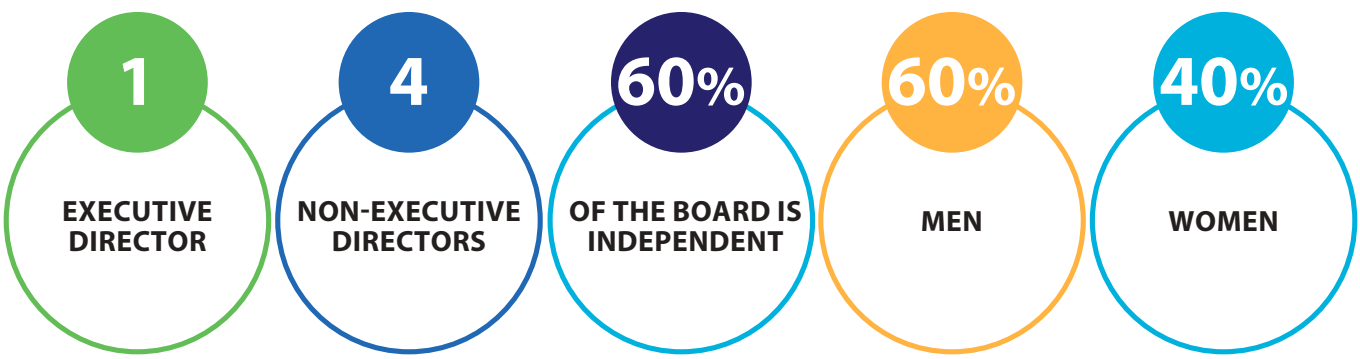
Chitranjan Kaushik
Chief Executive Officer

GOVERNANCE FRAMEWORK

TCE has a formal structure for corporate governance, which is reviewed and monitored from time to time by Board and Board Committees for managing the Governance system.

Governance structure

BOARD COMPOSITION



Mr. S Padmanabhan	Chairman, Member of the Audit and Risk Management Committee, Chairman of the Committee of Board, Member of the Nomination and Remuneration Committee, Member of the Corporate Social Responsibility Committee	Non-Executive Director
Mr. P K Ghose	Chairman of the Audit and Risk Management Committee, Member of the Committee of Board	Non-Executive Director
Ms. Neera Saggi	Member of Audit and Risk Management Committee, Nomination and Remuneration Committee, Committee of Board, Chairperson Corporate Social Responsibility Committee	Non-Executive Director
Ms. Hema Ravichandar	Chairman of the Nomination and Remuneration Committee, Member of Audit and Risk Management Committee, Member of Committee of Board	Non-Executive Director
Mr. Amit Sharma	Managing Director, Member of Nomination & Remuneration Committee, CSR Committee, Audit & Risk Management Committee	Executive Director

Key decisions by the Board

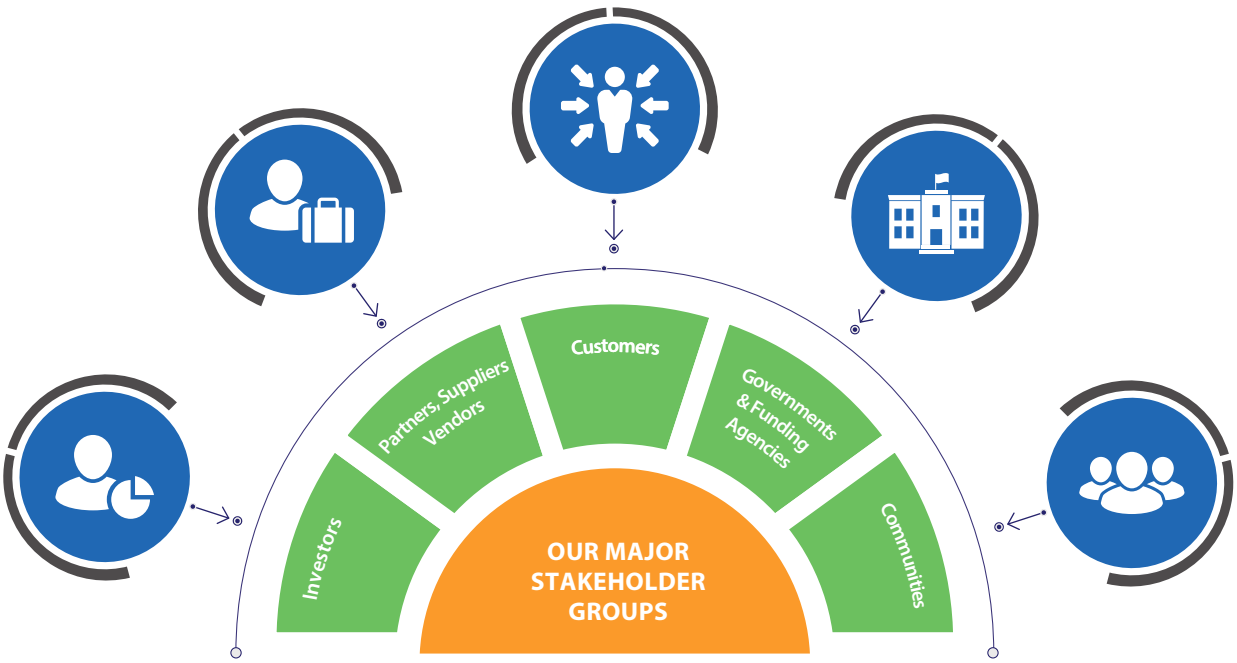
Area	Actions
Leadership Accountability	■ Audit and Risk Management ■ Nomination and Remuneration Committee ■ Corporate Social Responsibility Committee ■ Legal Compliance is done at Audit Committee meetings
Strategy Accountability	■ Company performance on the key business goals is also reviewed by the Board ■ Key achievements and important company affairs are reported to the holding company, Tata Sons annually ■ No. of Board meetings: 6 ■ Attendance: 100% ■ Key decision taken: (a) Established international footprint by opening a branch office in Netherlands. (b) Advanced Technology practice was set up as a Business Unit to drive OPEX related & digital engineering service lines
Fiscal Accountability	■ Legal and compliance audit conducted and recorded by the Audit Committee
Transparency in Operations	■ Relevant information, including financials is shared with all stakeholders on a timely basis ■ The Tata Code of Conduct was refreshed and employees trained ■ Anti-Bribery & Corruption and Anti-Money laundering policy was adopted in FY 2016-17
Selection of Governance Board members	■ Being a wholly-owned subsidiary of Tata Sons, TCE has adopted the procedure, defined by the Tata Sons Board, which includes: (a) Board selection methodology (b) Board governance system. The Independent Director Code is accessible from the Company website www.tce.co.in
Independence and effectiveness of internal and external audits	■ Professional and objective relationship is maintained between the Board of Directors, Management and Auditors, so as to provide to all a true and fair view of Company's financial statements ■ TCE has adopted the policy for rotation of the audit partners. The managing partner dealing with TCE, in both the cases, is changed periodically (5 years) to guard against potential conflict of interest and to bring in newer thoughts and ideas. Internal audit reports are presented to the Audit Committee and deliberated by the Board
Protection of stakeholder interests	■ Expectations from customers and employees are gathered through surveys and other mechanisms for communication / feedback ■ Feedback is reported to the Board on exception basis ■ Group HR and Legal also communicate with the Company Management on changes in policy guidelines ■ Key policies such as Code of Professional Ethics Policy, Prevention of Sexual Harassment Policy (POSH), Whistle Blower Policy, Gift Policy and Corporate Communications Policy providing press and social media guidelines are stringently applied in day-to-day practice
Sustainability and risk management	■ Risk management is included in the scope of the Audit Committee. As per policy, two cases are reviewed under Risk Management Framework and are presented in each meeting of Audit Committee. Formal risk management process is implemented at the proposal as well as at the execution level ■ Several safety standard from Safety in Design to Project safety management is being implemented
Succession planning	■ Succession plans for key positions are made and put up to the Nomination and the Remuneration Committee ■ Management teams are invited to make presentations to the Board on company matters. These meetings give the Board members an opportunity to assess the senior leaders' performance and capabilities

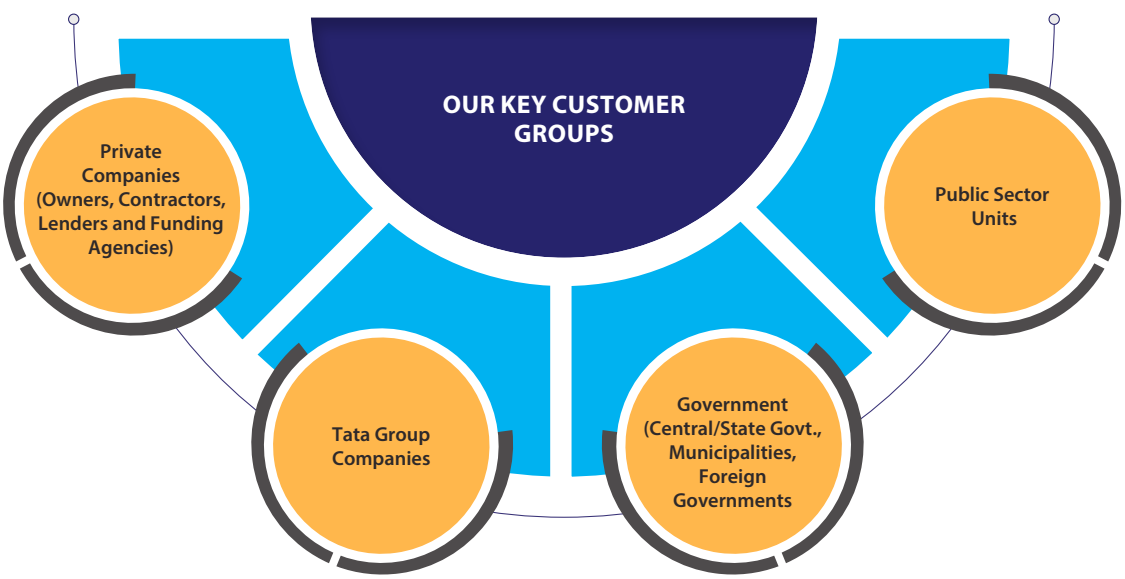
MATERIAL ISSUES

Our strategic focus areas take into account the material issues faced by our businesses. With our experience and through constant interactions with all our key stakeholders, we have identified the issues that are important for our stakeholders and at the same time affect our critical business success factors. Our top management believes the following issues are material for long-term growth and value creation of TCE.

Economic, Technological, Business, Environmental & Social

1. Geopolitical issues and macroeconomics
2. Dependencies on investment cycles
3. Regulatory and compliance related issues
4. Disruptive technology trends and developments
5. Contractual obligations
6. Brand and reputation
7. Financial – Currency fluctuation, other financial metrics, business environment specific
8. Currency fluctuation
9. Employee attrition and engagement
10. Talent management and resource competency
11. Legal and climate change

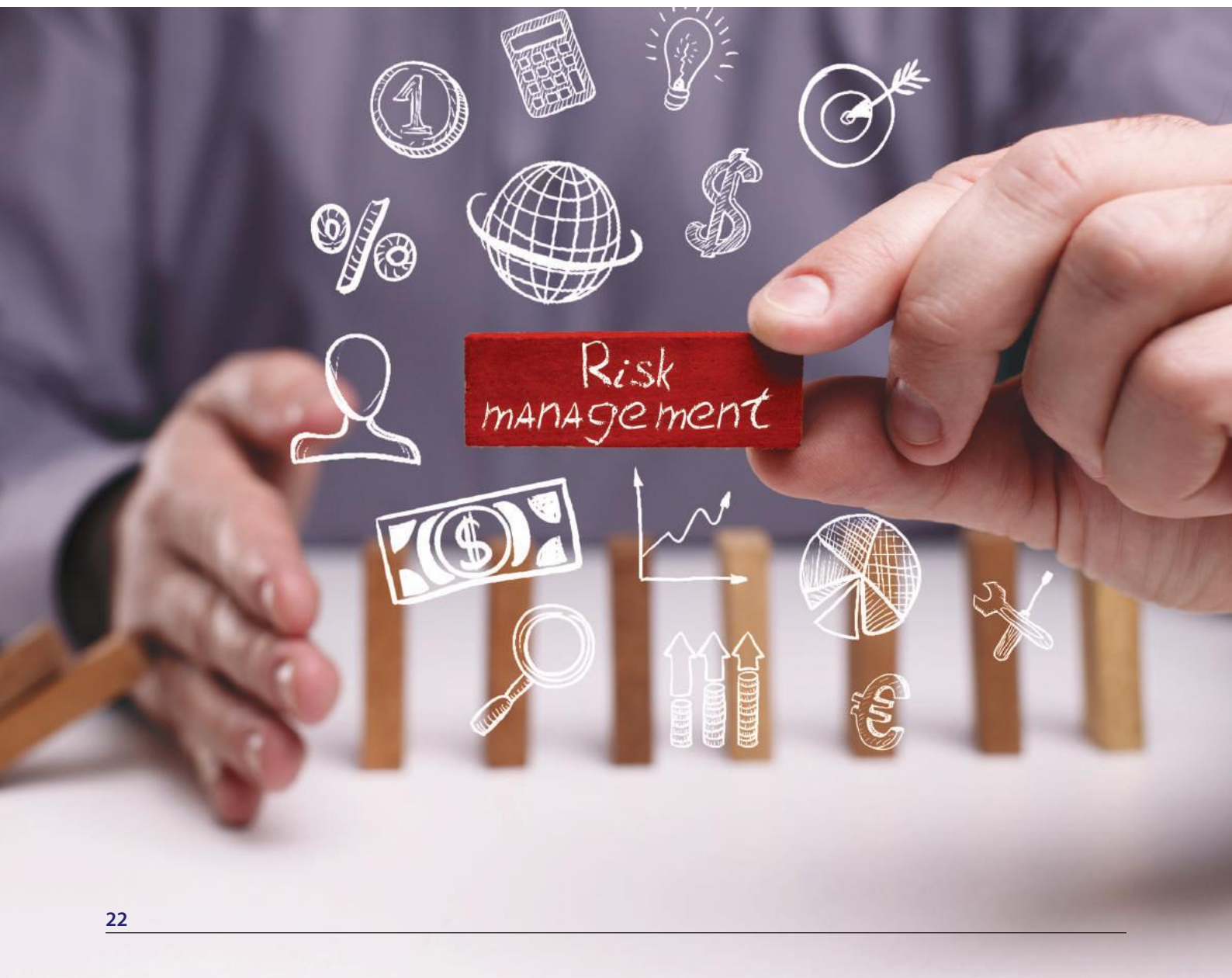

Customers
Partners, Suppliers Vendors
Governments & Funding Agencies
Investors
Communities
OUR MAJOR STAKEHOLDER GROUPS

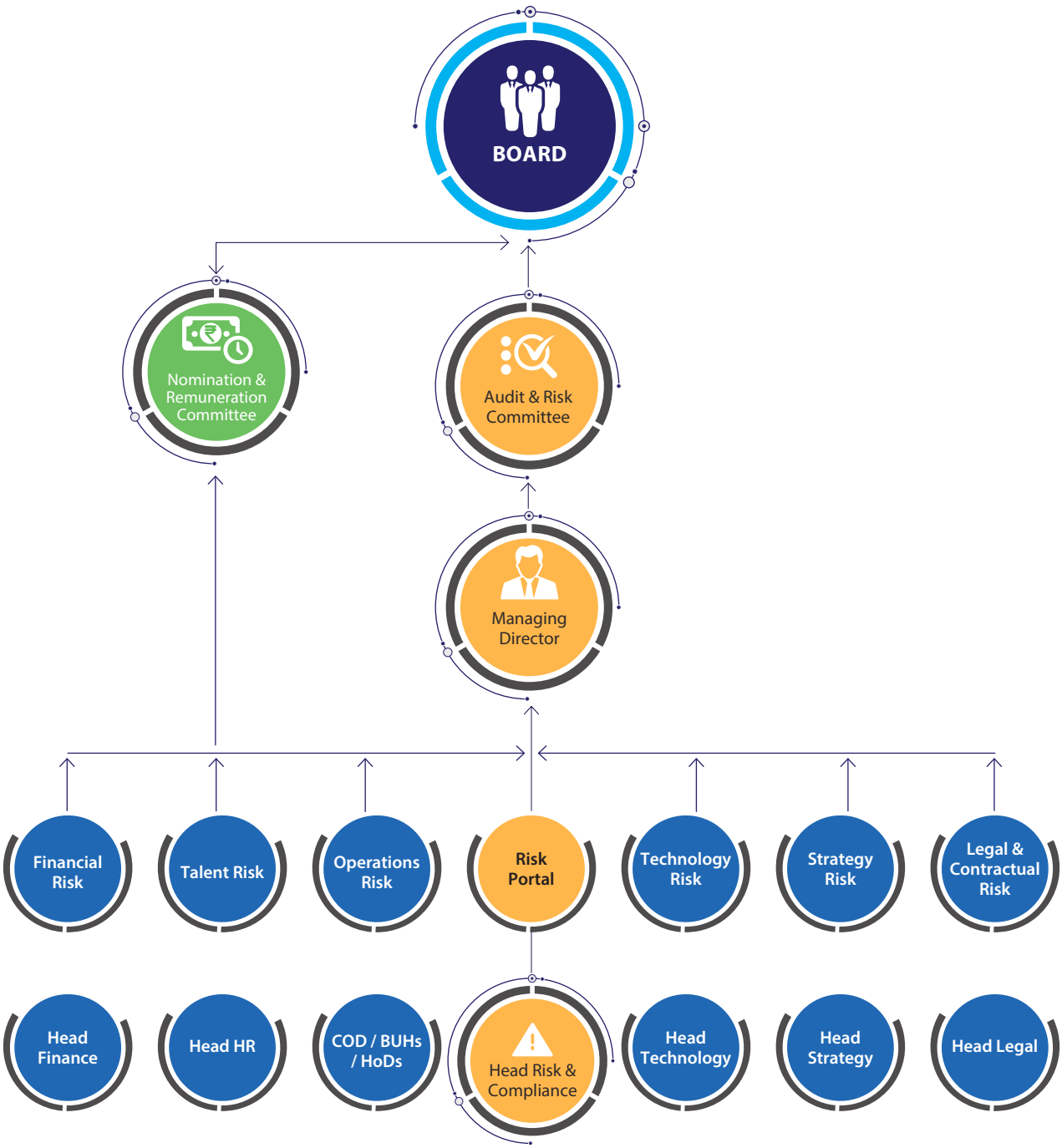

OUR KEY CUSTOMER GROUPS
Private Companies (Owners, Contractors, Lenders and Funding Agencies)
Public Sector Units
Tata Group Companies
Government (Central/State Govt., Municipalities, Foreign Governments

RISK MANAGEMENT

TCE identifies and manages risks using the risk management framework.

The core strategy is to deliver value by providing the best service to customers, at the lowest sustainable cost and in a responsible manner. In doing so the Company is exposed to a range of internal and external risks of various nature which can impact the achievement of these goals. TCE, therefore maintains a robust management process to continually identify, assess and manage risks.




BOARD
Nomination & Remuneration Committee
Audit & Risk Committee
Managing Director
Financial Risk
Talent Risk
Operations Risk
Risk Portal
Technology Risk
Strategy Risk
Legal & Contractual Risk
Head Finance
Head HR
COD / BUHs / HoDs
Head Risk & Compliance
Head Technology
Head Strategy
Head Legal

PRINCIPAL RISKS & UNCERTAINTIES

	Material matters	What are the risks	How we mitigated them
Strategic Risks 	**Challenging macroeconomic environment**	Dependence on capital investments and fiscal & monetary policy	Balanced market focus on domestic and relevant international markets Customised delivery mechanisms to add value to clients Established collaborations in key international locations
	Evolving regulatory landscape	Compliance and regulatory demands impact key business segments	Offered basket of services in the OPEX related investments of clients. Worked in Brownfield conditions providing modernisation and asset sweating solutions
Operational Risks 	**Shifts in technology, project demands**	Increasing automation and need for adoption of advanced technology Challenging project conditions	Increased training and investments in high end 3D, 4D, 5D suites to infuse predictability in projects in terms of cost and schedules Leveraging of multi-disciplinary talent across business segments
	Contractual demands & liability	Liability on site safety Stringent requirements in internationally funded projects	Introduced contract review systems, codes and standards for safety in design Introduced a safety portal for sharing of safety practices across TCE
	Pressure due to stringent cost cutting and tight schedules	Asset sweating by customers Project closure Delayed progression of projects in the case of complex projects	Turned this into an opportunity by using 3D simulations and predictive Industrial Internet of Things technology to provide asset life cycle management services Introduced monitoring mechanisms for projects, contracts and compliance Driving safe working conditions and practices in construction sites with a site-specific Safety Plan Provided guidelines and policies/processes for all contractors and vendors who operate at the site, in line with terms of the contract

	Material matters	What are the risks	How we mitigated them
Financial Risks 	**Counterparty Credit & Performance**	Financial assets consisting principally of marketable securities, receivables under pressure Profitability and pressure on margins due to competition Protectionist policies impacting project viability	Strengthened internal project management, work process & knowledge management systems for greater efficiencies Established MIS & project risk management systems for granular cost assessment & stage gate processes for billing and collections Local partnerships and leveraging technology capabilities and value engineering solutions as a differentiator
Sustainable Development 	**Employee Engagement**	Competitive talent poaching of resources with niche skills Redundancy of existing skills due to changing customer requirements impacting manpower utilisation	TCE believes in inclusive growth and employee engagement is an important aspect Workforce capability and capacity needs for the long and short-term are identified as a part of the Strategic Planning process Introduced identification and retraining of employees for deployment into new services
	Community Building & Environment	The continued success of our existing operations and our future projects are in part dependent upon broad support and a healthy relationship with the respective local communities	Our CSR strategy is to come up with initiatives which focus on all four aspects: infrastructure development, healthcare, education and sustainable development TCE advocates environment friendly solutions to customers like, green building practices, zero discharge solutions, renewable energy and energy efficient solutions and other value engineering solutions that reduce carbon footprint Various projects have reduced costs by adopting innovative engineering to preserve natural resources, ensuring sustainable development. The Smart City plans are testimony to this.

STRATEGY PLANNING

At TCE, strategic objectives cascade from our over-arching vision statement.

TCE's long-term goals have been appropriately linked with medium-term goals, stakeholder requirements and value creation, which are key input to this process. The business outcomes are resultant of the stakeholder value proposition we deliver.

Our goals

To be ranked among global top 100 in our domain

50:50

Balance international and domestic market share

75:25

Serve as a trusted advisor to strategic clients and partners

30%

Increase revenue streams from OPEX-based offerings

Strategic Objectives FY 2016-17	Measures	Achieved against target/actuals
FINANCIAL		
Achieve profitable growth with working capital optimisation	Business Orders	**84%**
	Total Revenue	**104%**
	PBT	**108%**
Acquire business in new sectors/services in international markets Increase market share through consortiums and partnerships	International Business orders	**82%**
	Business from OPEX Services	**93%**
	Business from Partnerships, Consortiums and Joint Bids	**100% retention of collaborations**
CUSTOMER		
Offer cross-business and integrated solutions across customer asset life cycle	New orders won with multiple BUs cross selling services	**Highest order bookings**
Increase customer engagement through relationship building	Customer engagement and insights	**100%**
Trusted advisor to strategic/key clients	Recurring business from partner client	**6 Dedicated Engineering Centres (DEC)**
INTERNAL BUSINESS PROCESS		
Proactively identify partnership opportunities	Proposals through partnerships, consortiums, joint bids	**Joint go-to-market approach with clients and technology partners in IIoT & emerging segments**
Enhance key processes through delivery, sales and technology excellence	Revenue productivity	**96% of target**
	Technology offerings developed	**Increase of 20% over FY 2015-16**
	Publication in reputed technical journals	**75% increase over FY 2015-16**
Improve productivity and optimise cost	Efficiencies in working capital management & productivity	**Gradual progression being monitored from FY 2016-17**
LEARNING & GROWTH		
Build capabilities in international business	Training and Development	**25% of talent trained for managing international assignments**
Attract, retain and develop talent and create a vibrant work environment	Attrition	**Sustained previous year's rate**
	Employee Engagement Survey	**20% increase from previous**
Be a responsible member of society	Safety Index	**4.24 (actual)**
	Corporate volunteering	**75% over FY 2015-16**
	Ethical concerns resolved	**100%**
	Spend on CSR activities	**80% increase over FY 2015-16**

STRATEGY PLANNING (Contd.)

TCE 4.0 Strategy

RHYTHM 2.0	Customer **Create value to capture niche markets directed by customer requirements**	Collaboration **Expand and scale up collaborations with consortium partners in the value chain**	Capital **Build efficiencies in working capital and human capital management for a robust bottom line**
Market Focus - Sales Excellence	Trusted advisor to strategic clients Increased Customer connect through relationship building Retain market leadership in key sectors in domestic markets	Focus on large accounts Consortiums, partnerships and joint bids Penetration in focused geographies internationally	Focus on key financial metrics to optimise profitable services in both Capex and Opex accounts
Delivery Excellence	Delivery excellence, based on customer centricity quality and focus on value engineering Build long-term relationships through delivery excellence	Leverage existing capabilities in handling complex and multi-pronged projects Enhanced predictability, planning via collaboration and use of document management and digital engineering tools	Enhance human capital focus an build a creative and engaged workforce Optimise working capital management Ensure bottom line focus with IT systems and tools for ensuring cost efficient delivery systems
Technical Excellence	Enhance customer connects and focus on innovative solutions to meet their unique demands and needs across the Asset life cycle	Offer cross-business and integrated solutions across the customer asset life cycle – via collaborations, partnerships and consortiums	Train and engage workforce in emerging technologies relevant to services various stages in asset life cycle

OUR VALUE CREATION MODEL

At TCE creating sustained value for all the stakeholders is at the core of our strategy. Hence, through this report it is the Company's endeavour to present the value creation model and how it impacts its capitals. TCE has provided a combination of quantitative and qualitative information of the six capitals that are deployed in the operations.

Six Capitals

FINANCIAL CAPITAL
Comprised of funds we raise, our earnings and the overall revenue generated.

MANUFACTURED CAPITAL*
Project design, engineering, construction, maintenance and management – including, specific stages when we use materials, equipment, tools and technologies.

INTELLECTUAL CAPITAL
Process Innovations for increasing project efficiencies, value engineering and advances in digital technologies, services in Industrial Internet of Things (IIoT), Knowledge Management and IPR.

HUMAN CAPITAL
Collective skills, knowledge and capabilities of our employees and contract staff are at the heart of our business operations.

NATURAL CAPITAL
We ensure that our project activities and our clients' activities, have minimal impacts on the environment. We also provide solutions that optimise natural resources at project sites.

SOCIAL AND RELATIONSHIP CAPITAL
We share knowledge, and work within regulatory stipulations; provide financial and technical support, and ensure employee involvement for the benefit of communities. This, in turn results in long-term relationships with the communities, clients & partners and all other concerned.

Inputs

FINANCING
- Equity
- Debt

MATERIALS, TOOLS & EQUIPMENT

EMPLOYEES
- For engineering solutions
- At project sites

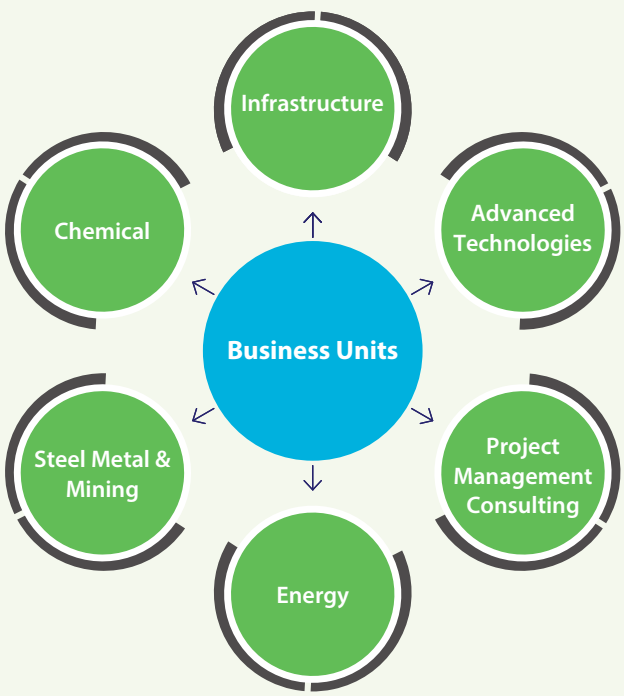
SOFTWARE LICENSES, TECHNOLOGY MANAGEMENT INSIGHTS
- Design Engineering
- Project Management Consultancy
- OPEX optimisation
- Knowledge management

SUPPLIERS & VENDORS, COLLABORATORS & PARTNERS

RAW MATERIALS, UTILITIES – ENERGY, WATER, PAPER

* TCE is an engineering solutions provider and does not have a manufacturing facility of its own, hence the interpretation of the Manufactured Capital is in alignment with the businesses we are in.

Business Activities



Strategic Focus Areas

- Achieve profitable growth with working capital optimisation
- Offer cross-business and integrated solutions in domestic and international markets
- Enhance key processes through delivery, sales and technology excellence
- Collaborate with key client-partners to provide value
- Be a responsible member of the society

Outcomes

CUSTOMERS
- Service quality and service delivery optimisation
- Process and cost efficiency
- Safety and regulatory compliance

SOCIETY
- Less water and energy used in industrial processes
- More efficient procurement and use of non-renewable resources
- Expenditure towards CSR
- Used core skills for sustainable livelihood for marginalised sections

EMPLOYEES
- Total workforce: 2,900
- Talent Fulfilment: Employee Engagement Survey ranking TCE on par with other companies

RETAILERS & VENDORS
Association with vendors and suppliers in a transparent manner under several defined codes of conduct

GOVERNMENT
Contribution to the exchequer

OUR INTEGRATED APPROACH: FY 2016-17

Financial Capital

₹ in crore

REVENUE	NET WORKING CAPITAL	NEW BUSINESSES/ ORDER BOOK VALUE
574	222	922

Manufactured Capital

₹ in crore

INVESTMENT IN TECHNOLOGY TOOLS

42

Average capex investments over 3 years

Intellectual Capital

INNOVATIONS SUPPORTED*

4 Cases

PATENTS FILED/ PENDING AND GRANTED

Patents filed (till date) **7**

Patent granted **1**

TECHNICAL PAPERS PUBLISHED

21

VALUE ENGINEERING SOLUTIONS PROVIDED ₹ in crore

Value addition

45

In terms of Capex/ Opex savings

217

SIGNIFICANT ERRORS PER CRITICAL DELIVERABLE

0.38

* For technology function only. Value Engineering Solutions are provided for all projects in the course of project delivery too.

Human Capital

DIVERSITY FIGURES

Women

15%

Men

85%

TRAINING MAN-DAYS PER EMPLOYEE

18.67

SAFETY INDEX SCORE

Safety in office

90.66

Safety at site

4.22

Natural Capital

TOP FIVE INNOVATIVE SOLUTIONS FOR PRESERVING NATURAL CAPITAL

- 3,000 MT Municipal Solid Waste per day to generate 25-30 KW energy, ₹ 80 crore alternative revenue streams
- Retrofitting STP for liquid waste to renewable energy in Bengaluru to generate 35% of the total energy requirement for the operation of sewage treatment plant with CDM benefits of about ₹ 4.61 crores per annum
- Sustainable Smart City planning for a capital city in southern India without disturbing existing dependencies. Also, created navigable canals and riverfront development plans for commerce and tourism.
- Applying process innovation in Flue Gas Desulphurisation (FGD) systems by retrofitting FGDs to thermal power plants to reduce pollution
- Involved in solar power generation of about 3 GW and about 76 solar power projects.

Social and Relationship Capital

₹ in crore

TAXES PAID FOR ECONOMIC VALUE GENERATION - EVG

73.68

CORPORATE VOLUNTEERING MAN-HOURS

12,338

EMPLOYEE VOLUNTEERS IN NO.

639

Projects in each focus area:*

1. **Health** - Engineering services for **2,700** toilets
2. **Education** - Career counseling for **1,410** adolescents and bridge school for **75** migrant workers' children
3. **Sustainable Livelihood** - Floriculture, forestry and poultry in tribal village
4. **Infrastructure** - Uttarakhand relief and rehabilitation

CSR EXPENSES

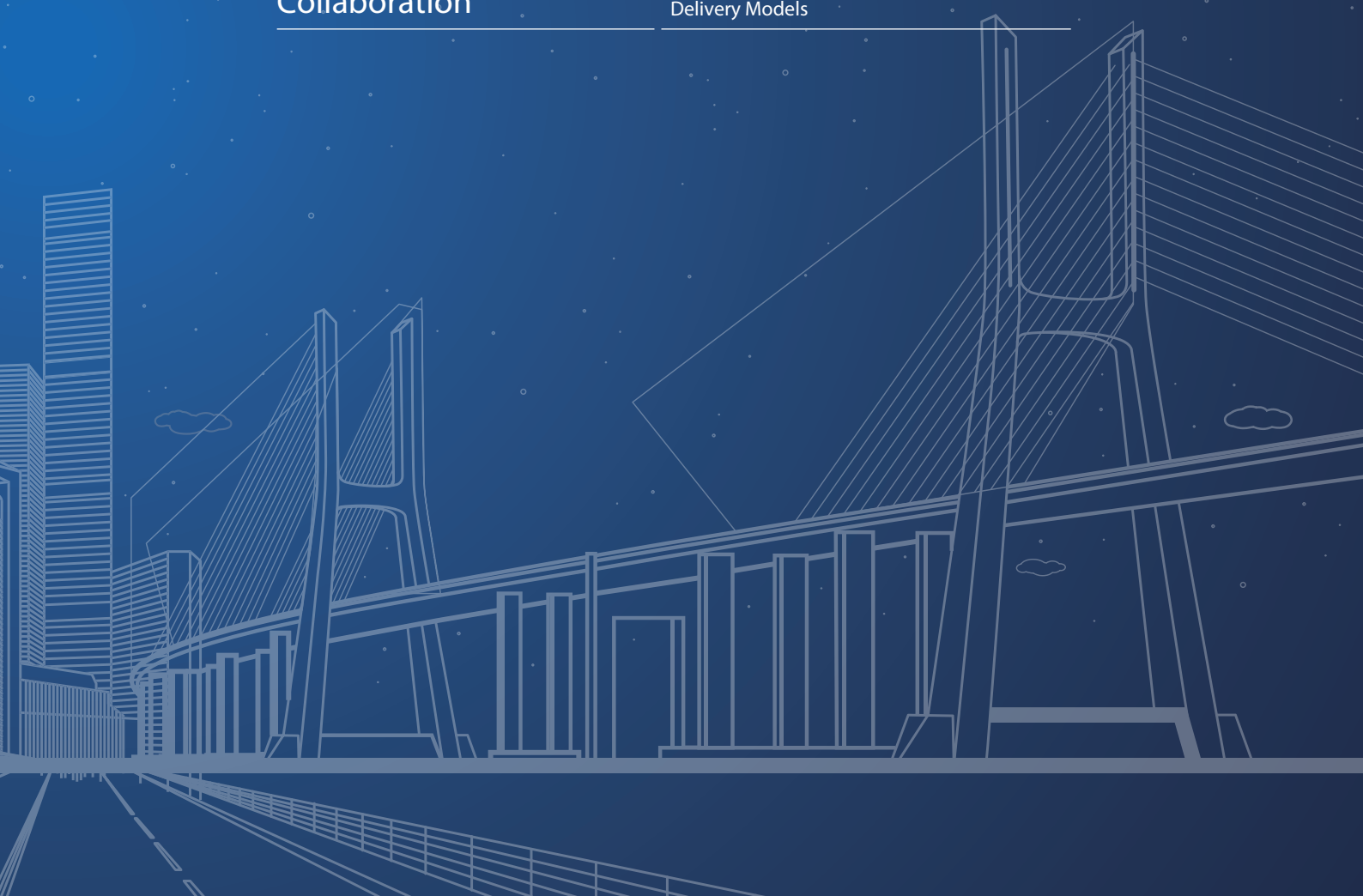
1.05

* These are flagship programmes only. Excludes short-term corporate volunteering programmes conducted twice a year.

COLLABORATE.
EVOLVE.
LEAD.

At TCE, the core business goal is to enhance customer experience with improved focus on creating innovative solutions to meet their unique demands and needs. Over the years, the Company has been able to expand its reach to international markets and ensure differentiated, unique and niche offerings. This is an outcome of resourceful collaborations within teams and partners and constant engagement with the customers.

Collaboration Approach	Aspects
Internal Collaboration	Rhythm and WoW
Partner Collaboration	Consortiums, Partnerships and Joint Bids
Customer Collaboration	Dedicated Engineering Centres, Customer Feedback Index, OPEX Services, Virtual Delivery Models



BUILDING SYNERGIES

Internal Collaborations

TCE adapted Design Thinking principles to plan out process efficiencies. Through internal collaboration, the strategy and road map for the year was deliberated and derived.

RHYTHM 2.0

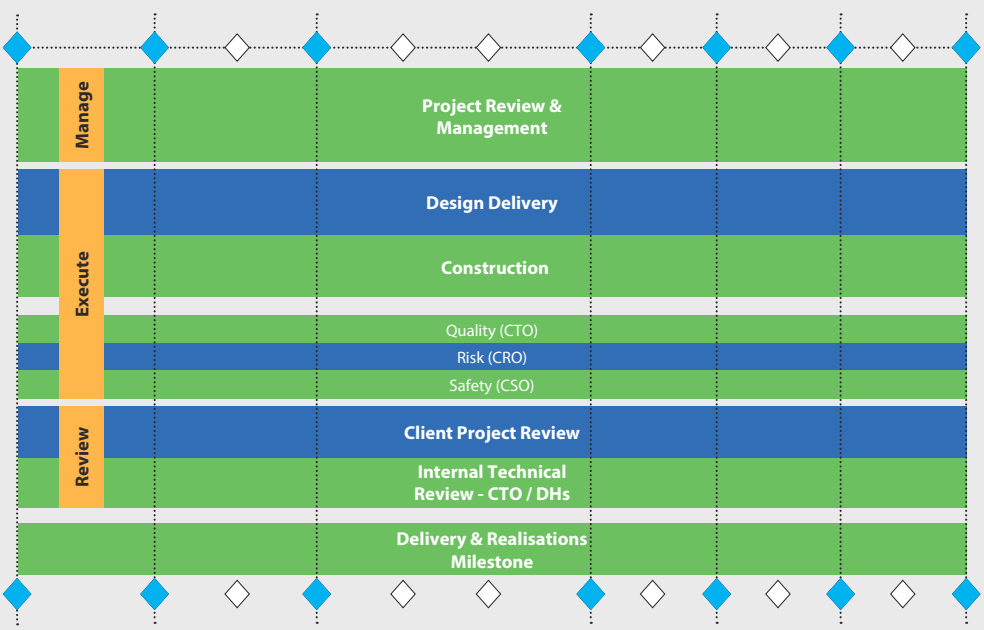
Rhythm is an initiative to drive transformation within the organisation to achieve organisational goals. TCE adopted the business process engineering framework in 2012, in order to drive process improvements across the Company.

Rhythm has been instrumental in driving organisational transformation, including changing the organisation structure, increasing international footprint, digitisation of processes and improved customer service. Rhythm was driven with five levers namely Delivery Excellence, Sales Excellence, Operational Excellence, Technology Excellence and People Excellence. The initial programme was followed by Rhythm Refresh in 2014 and by Rhythm 2.0 in 2016. And an integrated delivery processes called WoW (Way of Working). Improvement plans, made by these tracks are integrated with our action plans, thus ensuring a holistic shift from As-is to To-Be process improvements. These new processes are being incorporated in our delivery mechanisms. The progress and action points on all the levers and the WoW process implementations are reviewed on a monthly basis by the Governance Track and by MD every quarter.

WAY OF WORKING (WOW) – A DESIGN THINKING INITIATIVE FOR PROCESS IMPROVEMENT

'Way of Working (WoW)', is an initiative to promote cross-functional exchange between employees, in order to deliberate

Standardised Project Lifecycle Management using STAGE GATE APPROACH



STANDARDISED PROJECT LIFECYCLE PROCESS ALIGNED TO

1. Engineering, design and simulation tools
2. Project, cost and contract management
3. Quality, safety, code and standard and regulatory need of the project
4. Industry best practices and standards
5. Broad classification under Plant and Building project lifecycle

on process optimisation. Employees and the leadership came together to 'Post-it' ideas and issues on a large WoW wall. Existing process flows were documented and brainstormed to capture the 'As-Is' prevalent systems. The teams again convened to define 'To-Be' processes by identifying problem areas and pitching in with modifications. This design thinking exercise helped standardise processes across various delivery centres and industry segments factoring in unique requirements of each industry. Currently the pilot newly defined process is being implemented and reviewed.

Going forward, the Way of Working will set in motion innovative new process that addresses the key issues for customers and the optimal way for TCE to stay competitive.

This collaborative effort is extremely relevant for our talented engineers to adapt to the dynamic changes in terms of customer's requirements and increasing use of automation and artificial intelligence. The WoW process and design thinking is also applied to include clients for certain complex projects to define systems at the onset of a project.

External Collaborations

Engineering consultancy is characterised by agility to provide a basket of services driven by market and customer demand. In the consulting space, synergies of complementary skills of various service providers offers integrated value proposition. When TCE built and developed partnerships with the Korean EPC players in 2013, it was a prelude to many such working collaborations with niche players.

KEY HIGHLIGHTS:

- Partnering with EPC players in Korea and jointly delivering projects across the globe. The fusion of technical expertise of TCE in the power sector and the Korean EPC's market reach across ME, Africa and Asia that proved successful
- Taking a consortium-based approach to joint bids in niche areas like Smart City development, port development helped TCE win bids in emerging prestigious assignments that helped TCE evolve from being an urban planner to lead consultants in Smart City masterplan, design and commissioning support
- TCE has forayed into engineering services in the Industrial Internet of Things. TCE entered into a collaboration with Cassantec AG and Dattus for leveraging core expertise in engineering processes, IIoT and automation applications and IIoT specific hardware to provide integrated IIoT solutions

A Customer-centric Approach

Participating in trend setting engineering in the era of industry 4.0, TCE's digital engineering capabilities were applied to serve as consistent partner for developing off-the-shelf automated solutions, modularised engineering solutions for large clients. TCE serves as an extended arm of these companies working in the client set up in-line with client standards. TCE has earned the trust and goodwill of such customers through its robust work ethics and integrity.

TCE is also a partner of choice for several customers looking for long-term relationships in OPEX related services that require modernisation and upgrades in a Brownfield environment. TCE's past success in similar assignments has enabled it to add value to international clients.

TCE also serves as an outsourced core engineering arm for a large Oil & Gas customer in the Middle East.

Customers require TCE to work with them on multiple projects by taking responsibility for certain project areas and delivering on the same. TCE appoints team leads, domain experts and supporting engineering teams for each of the identified areas and helps the client deliver on to the project within stipulated timeframe.

TCE established four Delivery Centres in FY 2016-17 to serve its marquee clients by setting up a mix of dedicated talent working on client's various projects and also providing flexible teams as and when required for various projects.

Such collaborative approach and customer driven service offerings has helped TCE evolve as an expert in niche areas. These initiatives have helped TCE align to its strategic objectives and drive its goals. Combined with delivery excellence, TCE hopes to be a leader in emerging service requirements in the engineering consulting space and thrive as a preferred partner to large clients.

FOSTERING GROWTH

In order to sustain and keep up the momentum, TCE has had to leverage its human and fiscal capital to stay profitable even in a challenging macro environment. Talent management and keeping its workforce engaged is a core focus for TCE. This has particular significance as TCE is among the few companies that has skilled engineering talent covering almost all engineering disciplines available under one roof.

Most significant cost elements in TCE's business are manpower, establishment, travel and software expenses. The prime profitability drivers are cost optimisation, effort utilisation and efficiency management, including management of working capital and revenue volumes. Hence, proficient management of the working capital and human capital defines the success of TCE's businesses. On the softer side, there is a need to keep skilled employees with niche talent continuously engaged through challenging assignments.

Working Capital Management

TCE has worked towards a positive future on the strength of the TCE 4.0 strategy. In line with the trends across automation and the Industrial Internet of Things, the Company's operations are transforming from just concept to commissioning, to include OPEX services in asset life cycle management. Going forward, TCE will be increasingly implementing standardised designs and/or adopting a modular approach to projects. Thus, efficiently managing lead time for design review construction schedule and project management costs. This strategy will also provide additional revenue streams and mitigate uncertainty arising from dependence on Capex investments.

Advances in technology can be used to help deliver improvements in the quality of the service. Embracing innovation and value engineering, using modern technology or techniques, is at the heart of how TCE does business and adds value to its customers.

Over the years, TCE has established itself as a robust entity with long standing relationships with the world-renowned clientele and a deep focus on innovation. The aforementioned strengths also makes the Company the most preferred choice amongst peers. This is evident in the success of the various consortium or partnerships that TCE has leveraged. This in turn has helped TCE evolve its service and delivery model to positively impact the capital.

Human Capital Management

TCE's services have evolved substantially and so has the nature of the revenue structures and the deployment of human resources. In recent times, TCE has shifted from a project-based approach to effort-based approach. This is more in light of the cross-selling opportunities that TCE has leveraged. The re-vamping of the Business Unit structure into a P & L based one for each segment or service BU, has facilitated this cross-selling opportunity. As such, projects have gotten more complex and the demands of different types of engineering talent such as civil, mechanical, instrumentation, applied engineering, digital etc. have necessitated a new approach of managing human capital. The per-requisite to this was robust internal systems that helps to monitor efforts of these multi-disciplinary personnel for every aspect of the project. Between concept to commissioning and post commissioning support, a variety of

skilled talent is deployed. This varied talent works on a distributed delivery model.

For a Dedicated Engineering Centre (DEC) in Mumbai working for a client in the Middle East, will require a tremendous amount of co-ordination and planning. There are teams at DECs interacting with teams at the client's premises. Good communication, planning and top-notch project management skills are the softer elements required. Proficiency in digital tools combined with core engineering domain for on-ground consulting is also a must. Hence the expectations from a skilled engineer today is markedly different and aligned to client requirements. This is the challenge that TCE faces today, in terms of training and development of domain experts.

Training programmes are designed based on strategic development initiatives such as 3D engineering tools, project management capability building, risk management programmes etc. TCE has structured employee engagement and skill management programmes that are aligned to the TCE values and strategic objectives. TCE is also conscious of driving integrity and establishment of codes and policies to protect employee interest. The Prevention of Sexual Harassment policy (POSH), the Whistle Blower policy, Safety Policy etc. protect stakeholder interests. TCE has introduced several women-friendly policies in order to retain women workers and young mothers.

Building the happiness quotient among TCE employees

Training

Young Engineers Development Programme (YEDP) an intensive 1 year training of campus recruits

Leadership Acceleration Programmes for various levels of middle management to seniors

Safety training at Design, Office & Sites

Skill Development

Technical, Behavioural, Project management & other functional programmes

Training on Ethics and Tata Code of Conduct

SMILE - e-learning portal for continuous skill development

Rewards & Recognition

Value awards

Spot awards

Customer appreciations

Corporate Volunteering

2 Tata Engage Volunteering programmes running for 2 months

Opportunity to contribute to TCE flagship & Group CSR initiatives

Employee Engagement

Direct interaction through Townhall meets

Annual TCE Day celebrated across locations where employees put up an entertainment show across locations

Other in-house competitions, at least 3 per annum

OUR BUSINESSES ARE EVOLVING

Targeted investment in our assets, processes and the people who operate them has supported sustained improvement in recent years in our performance. With cross functional collaborations within the organisation and our years of experience with renowned clientele, our business units (BUs) are evolving into a powerhouse of innovation. In FY 2016-17, we made great strides in improving customer satisfaction, underpinned by better operational performance.

PROJECT MANAGEMENT CONSULTANCY

The Project Management Consultancy (PMC) BU is a service business unit, which provides project management consultancy and construction management solutions as a standalone business to external clients and as a cross BU service to clients of other business units. Tata Consulting Engineers (TCE) is among the few consultants who have such integrated services to address customers' needs holistically.

TCE's PMC business has been driven by high level of technical expertise and a multi-disciplinary talent pool. Over the years, the BU has maintained operational excellence on the back of capabilities in successful completion of complex projects and stringent safety and quality control. Safety practices, adherence to regulatory framework, codes and standards in the relevant country and respect for the socio-economic environment of the project site are the key differentiators for TCE.

The business continues to create value in niche markets using state-of-the-art project/construction planning tools to bring about cost efficiencies to its customers. The business continues to invest in high end technology by adopting 3D simulation and 4D construction planning tools that shifts most of the decision making to the shop floor thereby reducing construction costs. Added to this is a track record of exemplary performance in past project management however demanding the project, making the PMC BU a high revenue generating business for TCE. Key growth segments are Infrastructure, Petrochemicals, Fertilisers and Power.

KEY HIGHLIGHTS OF FY 2016-17

- Exceeded targets in booking sales revenues
- PBT increased from 27.7% of overall TCE's PBT in previous year to 33.4% in FY 2016-17
- International business contributed around 33% of overall revenue
- Recorded highest ever order book tally comprising 33% of TCE's total orders
- Notable project win includes the prestigious IIT Hyderabad facility Phase II, funded by Japan International Cooperation Agency awarded on the basis of niche technical capabilities
- Construction of a nuclear facility in the southern state of India was a commendable order win as the project called for a high level of technical capability and safety standards.

NEW TECHNOLOGY OFFERINGS

Construction simulation, Drone survey, Opex Management

SAFETY DATA FOR PMC BU

Man-hours worked at TCE – **7.15 million**

Man-hours worked on projects – **278 million**

Site Safety Index – **4.22**

KEY STRENGTHS

- Construction Management services is ranked 2nd in India
- **33%** revenues from International market
- Multi-disciplinary engineering talent under one roof
- Strong in safety process, codes & standards
- Pan-India presence

PROJECT MANAGEMENT CONSULTANCY (Contd.)

CASE STUDY

Large thermal power plant in Medupi (capacity 6 x 800 MW)

CLIENT TESTIMONY

"Since they (TCE) joined the Medupi Project, they've timeously supported all the major construction milestones, supporting the Commercial Operation of Medupi U5, and synchronisation of Unit 4, and are continuing to deliver quality assurance work for the remaining Units 3, 2 and 1"

Jacky Mathobela,
Project Engineering Manager, Medupi Project

TCE PMC BU provided Field & Quality Management Services for the Medupi Power project in South Africa to overcome the boiler quality issues which affected overall project performance. This is the largest coal-fired plant and largest dry-cooled power station in the world. TCE was consulted for quality interventions to ensure compliance as defined.

CHALLENGES

The construction site posed huge challenges due to the nature of the terrain which was undulated. TCE took a new and unique approach by planning construction of units 6 to unit 1. The rock conglomeration on the southern side was excavated and reused as the engineering fill on the northern side. While implementing a complex construction plan, TCE teams also faced the challenge of lack of local expertise and talent , power outage supply, labour unrest and capital flow issues.

OUR APPROACH

With an integrated approach of using technology insights, providing environmental solutions, making use of project management expertise, the BU could commission three units within a short turnaround time.

VALUE CREATION

Manufactured Capital

Medupi project will add 12% to the client's power generation capacity, which can power Johannesburg and Pretoria at peak hours. The Company is on a positive trajectory with its energy availability at 77.3% and operational surplus capacity of 5,600 MW.

Intellectual Capital

Our best technical/quality practices helped to improve the project time lines by avoiding repeat works.

Human Capital

Project provides direct employment to almost 18,000 people and also generates more indirect employment and entrepreneurial opportunities in the region.

Natural Capital

Developed as a zero-liquid effluent discharge station that continuously monitors emissions, all the cooling towers utilise direct cooling technology which uses air-cooling condensers. Improved environmental performance via lower water usage, air bag filters, low NO_2 burners and supercritical boilers was achieved.

Social and Relationship Capital

With the commissioning of the project, the availability of power and easing of load shedding in the region, South Africa's Gross Domestic Product (GDP) is expected to increase by about 0.35%.

Project received a special recognition for helping with refurbishment and building educational infrastructure in the Lephalale area. Medupi and its contractors invested over R 87 million in numerous community social investments (CSI) initiative. Project site was built on the principle of zero tolerance to harm.

ENERGY

Historically, India as a developing country has always relied on coal-based power generation and Tata Consulting Engineers Ltd. is among the leading consultants in this segment. However, the last financial year saw an extraordinary trend with renewable energy generated being twice as much as the thermal capacity added for the same period. According to a Central Electricity Authority of India report, a total of 6,990 megawatts of coal-based power capacity was added in India in FY 2016-17 while the thermal power capacity addition during the financial year stood at 7,655 megawatts. In comparison, 14,140 megawatts of renewable energy capacity was added in the same period. This trend sums up the state of the Company affairs as far as the Energy business unit is concerned.

The Energy BU, has displayed its agility in preparedness for such changing trends specific to each market it operates in. Some regions sustained demand for coal-fired power plants, while others required modernisation and asset management solutions to upgrade to new compliance norms. The Energy BU strategically repositioned itself in all areas that posed a demand.

TCE's Energy BU's strategic offerings are positioned as:

- Lender's engineer and owner's engineers in the domestic and African markets
- Collaborates with EPC players in the Korean and Japanese markets
- OEMs for plant engineering and modularised engineering solutions for large MNCs for country-specific reference plants
- Dedicated engineering centre for a large client for solutions in gas-based power plant

With such a distributed and collaborative approach, FY 2016-17, helped the Energy BU contribute about 25% to overall revenue. While the thermal and T & D sectors were less optimistic, the renewable sector shows a lot of promise in terms of new order bookings. The overall power generation sector (thermal and renewable) was challenged due to low tariff regime. The Energy BU worked on internal systems and delivery processes to protect margins. New service offerings in OPEX investments, in upgrades, regulatory compliance related upgrades and replicating the success in the Korean markets to include more of South East Asia helped to expand market footprint. Going forward, TCE's Energy BU hopes to add on to its service portfolio with a host of green and clean power solutions across sectors.

THERMAL

Domestic markets for thermal power were stressed due to increasing concerns over climate change. Suppressed demand, issues related to raw material linkages, controlled power tariffs resulting in stalemates in power-purchase agreements and drying up of funding, have left several power units idling. Demand for captive power generation requirements is not

KEY HIGHLIGHTS

- Empaneled as Gold Class Service provider serving as an outsourced arm for a gas power US MNC
- Successful collaboration with several OEMs that adopted modularisation to develop gas turbines providing plant engineering for country specific reference plants
- Replicating the success formula in South Korea, expanded footprint in South East Asia to Indonesia & Malaysia
- Solar PV sector growth of about 350% in FY 2016-17 over the previous year

KEY STRENGTHS

- Contributed to 90 GW energy generated
- 40 GW energy production underway
- Growth markets: SE Asia, Africa & Middle East
- 76 Solar PV projects to generate
- 3,320 MW solar power under implementation

ENERGY (Contd.)

strong enough to sustain the growth momentum. policies in several countries for local capacity building and regulatory restrictions posed challenges in the overseas markets even though there was great scope in power generation capacity.

Countering adverse conditions through local collaborations

Turning adverse conditions into opportunities, the Energy BU leveraged the 35 GWe capacity addition opportunity in Indonesia by collaborating with local EPC players, replicating the Korean success formula for TCE. The Energy BU got a breakthrough to provide basic and detailed engineering services to local EPC companies and the same formula is being worked out in Other countries in ASEAN regions such as Bangladesh, Vietnam, Malaysia etc. in various areas such as OEMs, OPEX solutions and power generation - fossil fuel.

RENEWABLES

The Energy BU's renewable sector manages projects in solar, wind, hydro, biomass and waste to energy. With the Indian Government's thrust for green power, the solar power generation sector saw fast growth. The impetus for solar power sustained with incentives to the industry such as Government sovereign guarantee and low cost funding by financial agencies. However, competitive pricing, has brought about a downward spiral in the solar power tariffs challenging margins. TCE is involved in about 76 solar PV projects that are presently in various stages of development. The Energy BU streamlined internal process and adopted standardisation principles and project efficiencies to keep the sector competitive.

The wind energy space is primarily dominated by OEMs. TCE leveraged existing relationships with a large international MNC to serve as an outsourced arm and deliver projects in new territories such as standardisation of wind turbine foundation design. The range of services provided include engineering services for all aspects in connection to grids, Opex solutions such as re-powering old wind turbines in order to upgrade and augment capacity, reference designs and standardisation of foundations for wind turbines, etc.

Hydro power also appears promising owing to focus on green energy programmes. The sector is on the threshold of a turnaround with several stalled hydro projects being revived in the North East and Jammu and Kashmir states, Sikkim, Uttarakhand and Ladakh. The international market opportunities lie in Africa and Nepal which are being revived after the rehabilitation post the earthquake.

Other areas of opportunities arising from Opex investments related projects that require adjustments to facilities due to compliance and regulatory stipulations, requirements such as installation of flue gas desulphurisation systems within a Brownfield environment.

NUCLEAR

The Nuclear Energy sector of the energy business has left its mark in the industry by being a partner of India's nuclear energy programme. Over the decades, the nuclear sector has been part of the Directorate of Atomic Energy (DAE) providing services to some outstanding projects in the country and continues to retain its leadership position. However, such high-end, critical projects have very long project gestation schedules. The sector continues to serve as a reliable partner to many government and quasi-Government entities in the Nuclear energy industry. Currently the sector is involved in a Fast Breeder Reactor (FBR) for upgradation of modular reactor, and other assignments such as seismic margin assessments. Modernisation and safety are prime concerns in Nuclear energy and TCE is a trusted service provider in this area.

T&D

In India achievement of 24/7 power supply by 2022 is the target by the Government. However, the bottleneck in this plan is the last mile connectivity in the transmission and distribution side. TCE's expertise to provide value in this space is expected to yield good opportunities in the coming years.

Several Smart City projects in India also require smart T & D systems and smart grids. The Energy BU is working on the largest high voltage DC line from Raigarh, Chhattisgarh to Pugalur in Tamil Nadu in India. The project delivery expectations are set high with tough schedules to complete projects ahead of time. A DPR for 22 substations and 3,000 km transmission lines in Jharkhand a World Bank funded project is also expected to be complete by FY 2017-18. The international markets provide business opportunities in East African regions supported by international funding.

ENERGY (Contd.)

CASE STUDY

1,000 MW ultra super critical thermal power plant in Malaysia with Korean collaboration

The 1,000 MW supercritical thermal power plant undertaken by TCE is a testimony to world-class engineering and a fine example of collaboration for shared value creation. TCE is the first Indian engineering company to design a 1,000 MW single unit capacity plant.

CHALLENGES

The greatest challenge was to meet aggressive time-lines and schedule demands of the Korean EPC, a long-standing collaborative partner for the Energy BU.

OUR APPROACH

The Energy BU through this project stretched and scaled its expertise, expanding knowledge envelop from 800 to 1,000 MW and supercritical to ultra-supercritical plant design. The plant was successfully synchronised on schedule bringing about both partner and customer delight!

VALUE CREATION

Financial Capital

Plant commissioning as per schedules committed against LDs had an indirect positive impact on the financial capital, with no cost overruns for this project due to delays, which is typical for such large projects.

Manufactured Capital

Expansion of Manjung plant has helped enhance power delivery for Malaysian grid, enabling development of industry as a whole. Ultra-supercritical technology is most technologically advanced and it was a great transfer of knowledge to the local partners due to TCE's presence.

Intellectual Capital

Value additions in layout/sizing of feed water system resulted in cost optimisation (USD 200K) and operational improvements (life cycle cost reduction and ease of operation) for this plant.

Human Capital

Onshore and off-site team deployment, global engineering talent, competency and skill enhancement working on first of its kind project, cultural assimilation of teams (Korean, Indian, Malaysian) are the hallmarks of the human capital value creation.

Natural Capital

Ultra-supercritical technology being the most environment friendly solution, the plant has technologies for deNOx and deSOx. Thus, reducing the impact on the environment while providing cost efficient energy.

Social and Relationship Capital

Plant successfully synchronised with grid on schedule bringing customer delight; ultra-supercritical technology deployed with most environment friendly processes; enhanced relationships due to quality and timely delivery as one unified team with all stakeholders (EPC, contractors, suppliers, owner).

INFRASTRUCTURE

TCE's Infrastructure business unit continued its growth run in the last fiscal. With a Government focused on development, India's infrastructure development story is on a growth path. The growth opportunities in the domestic markets are driven in the areas of Smart cities, urban infrastructure and water and waste management sectors – the key areas that TCE has vast experience in. The BU order book for FY 2016-17 was above expectations setting a positive trend for the Infrastructure Business Unit (IBU) in the coming financial year. The differentiator that TCE and the IBU has to offer is its agility in adopting new technologies. As technology transforms the infrastructure landscape across the globe, the BU has leveraged its expertise in digital engineering resulting in business orders for high caliber projects.

In term of overall revenues, IBU's revenue share in FY 2016-17 increased to 18% of total TCE revenues as against 16% revenue share in the previous year. IBU's revenues from international business was at 14% in FY 2016-17 against 7% in the previous fiscal. The domestic markets showed promise in terms of new businesses IBU made a breakthrough in several smart cities and Brownfield city upgrade projects taking a consortium-based approach to bidding. Several large assignments under all the sectors are underway and the year ahead looks promising.

KEY STRENGTHS

- 59% of new business through collaborations and consortiums
- Engaged in 6-year planning for Clean Ganga Mission for river's course extending 3,000 km across 5 states, 119 towns
- Impacting the quality of life with infrastructure solutions for 25 Smart Cities & 50 (AMRUT) cities
- Collaborating with consortium partners, all leading international funding agencies
- Managing 139 waste management projects for Urban Local Bodies across the country
- 6 Waste to energy projects to generate energy ranging from 5-15 MWe
- Conceptual architecture & planning for futuristic robotic museum, a first in the country

KEY HIGHLIGHTS

- Achieved 29% Revenue Growth over FY 16
- Completed landmark Blue Consultant project for a capital city, with solutions to create navigable inland waterways while keeping the agricultural bank undisturbed
- Digitised data capture of 3,000 km stretch of the River Ganga, adjacent towns and cities using Geographic Information systems (GIS) mapping. Cloud-based app, Project Information Management (PIS) system developed
- Digital water management solution for Bengaluru city authorities - IIoT-SCADA systems on GSM platform
- Several cities mapped under GIS for future engineering big data analytics in order to efficiently manage city administration, revenues, disaster alerts and automated controls for all linked utilities
- Developed capabilities for conceptual architecture and master planning practices providing end-to-end architectural services strengthening the BU in city planning

INFRASTRUCTURE (Contd.)

CASE STUDY

Bhopal Smart City

CLIENT TESTIMONY

'The work done by TCE on the ABD master plan, reports for approval, tenders, rehabilitation and walk through are commendable. We hope TCE will continue this momentum and together we will be able to deliver a smart ABD to the citizens of Bhopal.'

Executive Director,
Bhopal Smart City Corporation Ltd.

OBJECTIVE

To plan/design a people-centric district that will serve as a paradigm for Smart City development, improving quality of life through connected communities, advanced infrastructure, mobility and ambiance.

PROJECT DETAILS

Lead consultants for Smart City-from concept plan for various infrastructure components, such as water supply, sewerage system, storm water drainage, solid waste management, power, Information and Communication Technology, gas utility for the Smart City.

CHALLENGES

The primary challenge was managing expectations for creating infrastructure in a greenfield environment within Brownfield confines. Upholding the sentiments of diverse communities while focusing on economic and environmental parameters is a challenge that TCE was sensitive to.

Relocation and rehabilitation of:

- 3000 Government quarters
- 11 Municipal Schools
- About 500 shops & 100 vendors
- Existing infrastructure - 9 elevated water tanks, pipelines, electric substations
- 6,000 trees
- About 40 religious places
- Managing 4,72,000 tonnes of debris post demolition of existing buildings

OUR APPROACH

TCE took a collaborative approach for the project and to address socio-economic challenges. An area-based development comprising 342 acres was planned with a view to replicate and scale in other areas. The development plan was citizen-centric. The heart of the city was transformed by enabling excellent connectivity through Bus Rapid Transit System (BRTS) and planned a Metro line. This design can be replicated at other transit nodes of the city where Government land is available.

VALUE CREATION

Financial Capital

Creating new avenues of transport, trade and income generation within the city. Opportunities for income from tourism with tourist spots within 3 km radius. Stadium and recreational infrastructure for income from sporting and cultural events.

Manufactured Capital

20 lakh sq. mt. of built space for shops and establishments.

Intellectual Capital

Smart Utilities like Underground Utility tunnel for physical infrastructure, automated Solid Waste Management system, Intelligent Traffic Management and Interconnected large open spaces and pathways.

Human Capital

The city is planned with a 20-year horizon provisioning a population growth from 25,000 to 60,000 with smart infrastructure, public transport, green spaces and better quality of life.

Natural Capital

Open spaces increased from 23% to 42% and over 3,000 trees have been conserved. Nearly 10% energy generated is planned from solar panels and bio-methanisation plant will be built for wet solid waste management. Provision for last mile connectivity, cycling tracks, that will encourage public transport usage and reduce pollution from cars. Rainwater harvesting and sewage treatment for recycle and reuse of water.

Social and Relationship Capital

Employment generation expected is to the tune of 70,000 in the service and hospitality sector.

INFRASTRUCTURE (Contd.)

Built Environment

Infrastructure BU's (IBU) Built Environment sector has a track record of delivering large and complex projects in Urban development, Buildings, Manufacturing facilities, Educational campuses, IT Parks, Hospitality & commercial complexes.

TCE's reputation and track record has been established over the years by collaborating and partnering with leading developers, architects and contractors working on both public and private sector development projects. Such collaborations enabled IBU's stronghold in India's largest infrastructure development – Smart City projects. Within a year of the announcement of the Smart City plan, the Built Environment sector holds about 10% of the Smart City market share. Taking a consortium based approach, TCE is involved in several major Greenfield and Brownfield projects. In FY 2016-17, the sector was involved in various capacities in about 25 smart cities and 50 Atal Mission for Rejuvenation and Urban Transformation (AMRUT) projects. A Smart City's command centre, the ABD building is the nerve centre that controls the ICT systems. TCE's master plan has enabled data collection of the entire city through GiS mapping. Going forward, TCE is geared to provide solutions in e-governance systems, city management, emergency and disaster management etc. through data analytics and operations support.

The Built environment sector has successfully completed master plans for land based cities, aerotropolis – airport townships and seatropolis – smart port cities. TCE has moved to 100% digital solutions with advanced systems such as Building Infrastructure Management tools for engineering design and 3D modeling. TCE's expertise in engineering capabilities and propensity to work in a collaborative environment has help leverage collective skills for a common goal. The credibility gained in the domestic markets and being consortium partners alongside global organisations have enabled TCE to expand its Built Environment footprint in the international markets.

INDIA'S FIRST SMART PORT CITY

Paradip in Orissa is being developed as a smart port city. TCE completed master plan for 2,600 acres – a model port city with infrastructure planned to address the needs of a bustling port with energy efficiency and pollution-free environment. This enables sustainable port operations and better city life, both coexist.

Water, Waste Management and Environment

The Water and Waste management sector is engaged in preparing Solid Waste Management Detailed project Reports for ULB (Urban Local Bodies - including Municipal Corporations, Municipal Councils and Town Panchayats) across India. Key areas of expertise include water distribution systems, storm water drainage systems, water treatment, solid and liquid waste (municipal) management, Environment Impact Assessment studies.

The Waste management sector, under the Government of India's Swachh Bharat Mission (SBM) is actively involved in the waste management practices of the ULBs - analyses the gaps in the system and provides solutions aligned to the SBM directives. In the domestic market the current waste management projects span four states.

BLUE PROJECT CONSULTANTS

Amravati, the new capital city has 50% of area the catchment area, hence prone to floods. TCE's master plan proposed:

- Network of water channels to serve as inland navigable waterways
- Retaining the rice bank intact
- Islets between the channels to serve as tourist spots
- Waterfront development and green cover

Location	No. of ULBs
Andhra Pradesh	22
Karnataka	28
Odisha	2
Madhya Pradesh	37
Maharashtra	50

Water management and distribution sector is currently involved in three major water supply projects for the states of Uttarakhand, Delhi and Madhya Pradesh and funded by the Asian Development Bank.

The sector secured record three water supply projects funded by the Asian Development Bank. TCE's water distribution solutions has helped to ensure 24/7 continuous water supply to homes and reduces wastage lost due to leakage. With more households in the centralised water distribution systems across states, water shortage can be completely eliminated. TCE has also mapped distribution data to IIoT and SCADA systems on GSM platforms enabling ULB engineers to control and monitor water distribution systems in real time.

Transportation

TCE has consolidated its Transport business focusing on last mile connectivity and concept to commissioning in all areas of transportation.

In view of this - ports, inland waterways, roads / expressways , metro/ railways / MMLP, airports and rope-ways - which are links to a transportation chain are now brought under the sector. This is expected to provide better synergy and growth.

TCE's longstanding relationships in the ports sector enabled business growth in both Capex and Opex projects. Most noteworthy was TCE's entry into areas such as rope-ways in Uttarakhand and Super expressway and services for an upcoming metro rail line in Maharashtra.

Future Strategy

Going forward, the Infrastructure Business Unit hopes to leverage the boost in the segment both in domestic and international markets. Water utilities, hospitality and transportation- water, ports, road, rail etc. are the areas that have opportunities for IBU in the overseas markets. In the domestic scenario, IBU hopes work with the Smart City establishments, work with other Tata group companies in areas of national significance and continue with the consortium approach. This will take the segment's growth to the next level and scale.

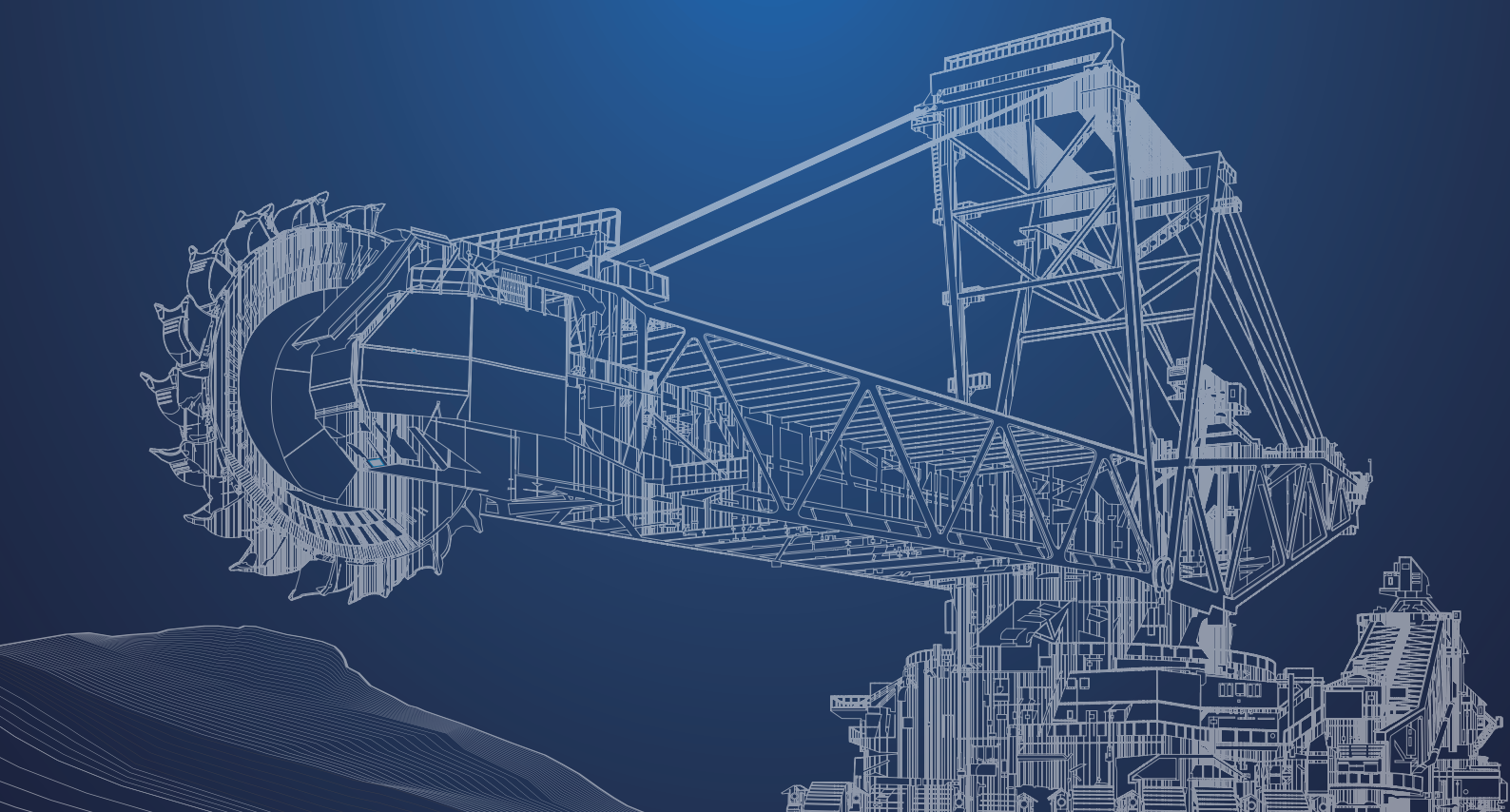
PROCESS: STEEL MINING & METAL

In 2016, steel demand recovery was stronger than expected with the upside mostly coming from China. 2017 and 2018 is expected to see a cyclical upturn in steel demand with a continuing recovery in the developed economies and an accelerating growth momentum in the emerging and developing economies. The mining industry has also borne the brunt of the global recession. Volatile commodity prices and currencies, rising costs, shrinking margins, project deferments etc. being some of the reasons. The domestic scenario continued to experience the stalemate both in the steel and mining sectors.

The Steel Metal & Mining Business (SMM BU) offers core engineering services pertaining to the iron and steel, mining and metals sectors. Import of coal continued to rise due to sluggish domestic coal production. Increasing regulatory regime and environmental compliance demands have turned into opportunities for the SMM BU.

The capabilities of SMM BU span across all facets of steel, metal & mining process - from concept to commissioning to asset life cycle management. This year, the BU's posted increased new order bookings on the strength of long-term OPEX related contracts in Europe.

A good mix of OPEX and CAPEX business improved the growth prospects of the BU. The unit is also witnessing healthy growth across its international business. In FY 2016-17, it enabled asset digitisation of a global steel major's blast furnace. In addition, it is helping the Company with a process unit revamp, which will be completed by 2020.



FY 2016-17 saw the share of international businesses in SMM grow to 75% from 25% in FY 2015-16. The SMM BU has successfully implemented technological know-how to deliver better productivity and predictability in terms of plant performance for many of its clients. With a strong in-house team of experts, it has successfully provided services like feasibility studies, DPR studies specific to mines, process improvements in steel and metals, mineral beneficiation, efficient material handling systems and terrain analysis. Keeping with the trend of integrated approach towards Industry 4.0 and digitalisation, the SMM BU provides new digitisation solutions in the Opex areas for process plants and equipment such as digitising existing plant (asset management), plant productivity enhancement, plant life assessment, structural health assessment etc.

Typically, Steel Metal and Mining industry is a mature one and still operates with 'old' facilities. While upgrades have continued to keep up with environmental norms, there is an increasing shift to Industry 4.0 capabilities, especially in Europe. In the Indian market, TCE's SMM BU has taken steps to generate interests in engineering in 3D environment and introducing 4D for construction planning and propagating 5D. TCE has made inroads in this area on the strength of overseas successes and is poised to make a change towards modernising and digitising the Steel Metal and Mining industry in India.

KEY STRENGTHS

- Reached break-even point and is heading towards profitability in the next FY
- Strong FY 2017-18 order books with digitisation & plant modernisation services
- Introduced IIoT services for plant optimisation and modernisation
- Undertaking plant upgrade solutions to meet environmental & safety standards
- Successful entry in digitised solutions in ME & Europe
- Commenced Phase II of zinc mining facility in Africa

PROCESS: STEEL MINING & METAL (Contd.)

CASE STUDY

The Gamsberg Project – World's largest zinc mining and beneficiation project

OBJECTIVE

The mandate was to turnaround a mine that was unviable and dormant for 30 years. The reserve was 200 metres underground and TCE had to ensure that the zinc is extracted in a cost efficient manner. The final produce had a high manganese content making it unviable to market due to the compliance norms of the country.

CHALLENGES

The biggest challenges for the project was the two-year capex expenditure for excavation to get to the ore cost effectively. Solutions were required to counter the low margins in selling price of the ore due to high manganese content and manage the manganese dump to fulfil regulatory obligations.

OUR APPROACH

TCE's core innovation to make the Gamsberg mine a profitable one is through mine planning and geo-modeling systems to get to the zinc ore 200 m deep cost efficiently; apply mineral beneficiation techniques and operation strategies to extract high zinc concentrate and separate the manganese; manganese concentrate management using recycling techniques and backward integration.

VALUE CREATION

Financial Capital

Turned around a mine dormant for 30 years, prospects for client as the world's largest zinc producer. Reduced Capex investments by 33.33%. Opex saving around 1 million USD per annum.

Manufactured Capital

Totally integrated mining process – beneficiation of zinc ore for quality, backward integration with reuse of extracted manganese waste.

Intellectual Capital

Used best floatation technology to help turn the project viable for customer. Applied mine planning software and geo-modelling systems to determine the mine casting techniques relevant to the terrain.

Human Capital

Collaborative effort will bring about knowledge sharing. Engineering partners from India, South Africa, China, Canada, Australia. Sourcing partners: China, Finland, USA, Canada, India, Vietnam & South Africa.

Natural Capital

Design to protect bio-diversity of the region, zero discharge facility, water recycling and reuse to reduce specific water consumption, technical processes to reduce environmental footprint.

Social and Relationship Capital

Benefit to the locale through increased economic activity, employment opportunities; potable water and other basic infrastructure to the nearby regions through CSR interventions.

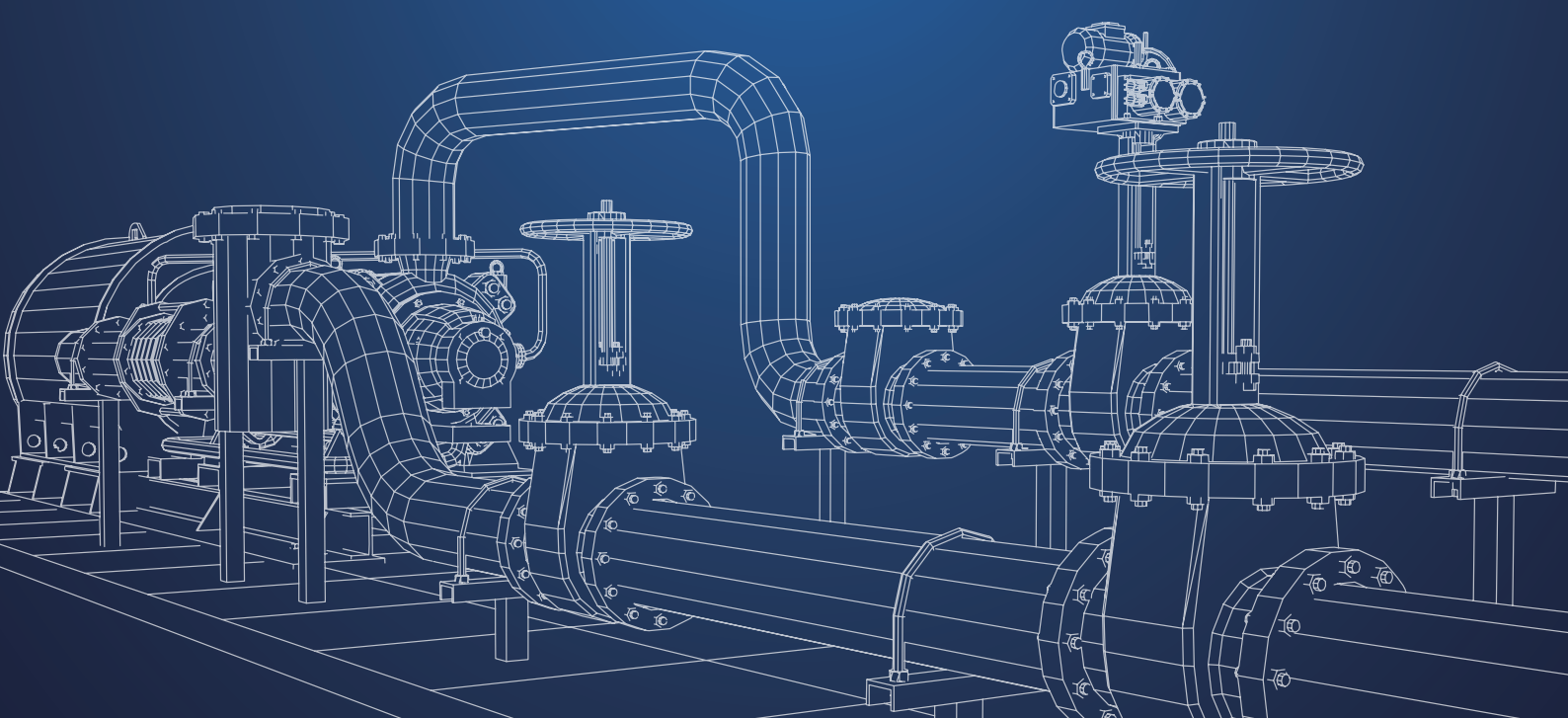
PROCESS: CHEMICAL

The Chemical Business Unit (CBU) provides engineering solutions pertaining to the process industry covering Oil & Gas, Fertiliser, Cement, Chemicals & Paints, Food & Pharmaceuticals and Pulp & Paper. Over the years, the BU has expanded its market reach with long-term alliances.

The Chemical BU continued its exercise in strengthening internal processes and systems to keep up with international standards. Safety in design and operations is critical in the chemical industry and TCE's Chemical BU is cognizant of the occupational safety and hazard control measures required. The Chemical BU workforce was oriented into Safety Instrumented System (SIS), which is one of the most important layers of protection against accidents and hazards in process industries. The BU has also oriented its workforce to adopt High Integrity Pressure Protection System (HIPPS), a type of SIS, designed to prevent over-pressurisation of a plant. These initiatives are in line with observing good manufacturing practices for operating in the industry.

In FY 2016-17, the BU successfully helped align advanced technology for an Indian tyre maker, which led to reduced Capex and Opex spends for the client. Further, as a part of its zero liquid discharge accomplishments, it guided a renowned healthcare brand to modify its existing tanks and utilised advanced technologies like Membrane Bioreactor (MBR) and Reverse Osmosis (RO) system to optimise the footprint area as well as better quality of treated effluent.

Overall business performance for the year 2016-17 was stressed due to depressed markets. Oil prices crashed substantially and as a result there was reduced CAPEX spends from clients. Existing client establishments focused on asset sweating and debottlenecking. Hence the focus was on tapping into the OPEX spends for such clients both in the domestic and international markets. This trend is expected to continue in the coming year and TCE's Chemical BU hopes to increase its business arising out of clients OPEX spends from 45% in FY 2016-17 to 55% in FY 2017-18. Thus a balance of the type of projects acquired and exercise for improvement in internal efficiencies, undertaken this year, will bring about a positive turnaround in the next financial year.



CASE STUDY

DEC for Petrochemical major in Middle East

KEY HIGHLIGHTS OF 2016-17

- OPEX services contribute to around 45% of overall business
- Consolidation of Dedicated Engineering Centre (DEC) for Middle East based Petrochemicals Major and start of similar relationship with an International Food Major

OBJECTIVE

Installed a new Titanium (Ti) catalyst unit to replace existing Lead (Pb) catalyst unit in the DPC plant of a major petrochemical Company in Middle East. The objective was to assist in environmental compliance and increasing business profitability for the client.

CHALLENGE

Meeting the increasingly stringent requirement of environmental regulations within given profitability constraints.

OUR APPROACH

Understanding clients' requirements, TCE adopted a holistic approach of assessing the project impacts on business profitability, regulatory compliance, as well as, environmental and social aspects. With the team's concerted efforts the BU could not only install systems which exceeded the environmental norms, it also led to a business upsurge.

VALUE CREATION

Financial Capital

Significant Capex reduction for the client (estimated 4.8 Mn USD).

Social and Relationship Capital

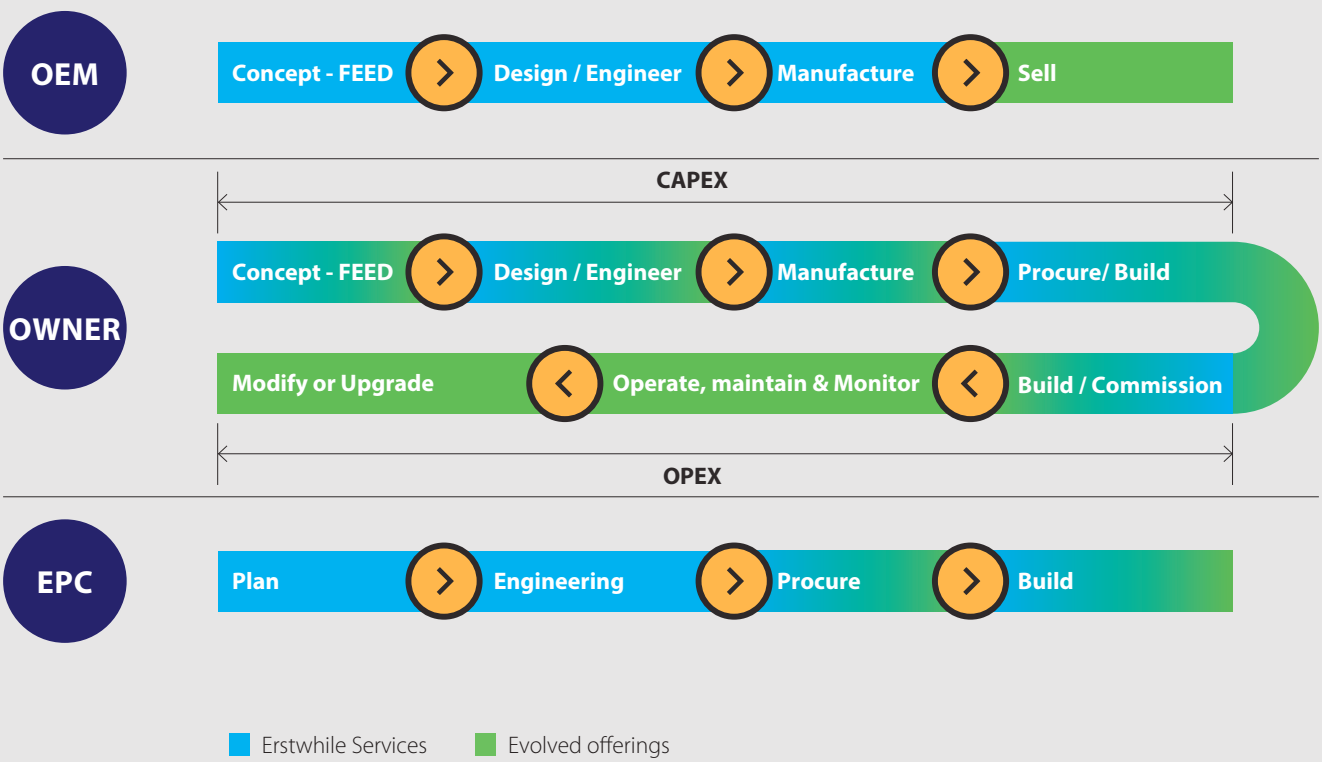
Prolonged relationship with client through a Dedicated Engineering Centre and integrated client management systems through virtual and on-site interactions provided value to client.

Natural Capital

Installation of Zero Liquid Discharge system and reduction in Green House Gas emission. Direct emissions in manufacturing & transportation of equipment, piping, instrumentation and electrical items to plant was reduced by approximately 30%. Power consumption of catalyst preparation unit was reduced as it was developed in vicinity of manufacturing unit. Reduced usage of steel, paint, insulation, electrical cables, etc. led to substantial drop in carbon emission.

OUR INDUSTRY LEADING SERVICES

We evolved to serve our customers



Engineering Studies and Design & Engineering

We provide cost-effective and comprehensive engineering solutions to clients across the globe. With an expert team comprising of multi-disciplinary engineering professionals and our advance technological processes we help our domestic and international clients optimise their operations and minimise risk.

We offer design engineering and engineering studies through our Delivery Centres or on-site. We provide a wide array of solutions under this service area, which includes:

- Project Concept Development
- Pre-feasibility and Feasibility
- Detailed Project Reports
- Environmental Study Reports
- System Studies
- Basic Engineering up to RFQ
- Procurement Support
- Detailed Engineering including 3D modeling
- Inspection Services, Assistance to Commissioning

In FY 2016-17, the services contributed ~50-54% to overall revenues. The most significant of all, we carried out large-scale environment impact studies and created a master-plan which entailed building waterways for a Greenfield capital city. Our excellent delivery mechanism has made TCE the first engineering company in India to operationalise a single unit capacity of 1,000 MW for an ultra super-critical power plant in Malaysia.

Project Management Services and Construction Management

We provide project management services to a number of clients worldwide. Over the years our expert project management teams have provided cost effective and quality solutions to our customers. We pride ourselves in providing customised and relevant services and have become trusted advisor's for many of our clients.

We provide a wide array of solutions under this service area, which includes:

- Project management including construction monitoring and control
- Site supervision
- Safety management

In FY 2016-17, this service vertical contributed to around 33-36% to the total revenues. Our high technology score won us a PMC services bid for a large nuclear facility in India.

Opex services

In order to offset the dependence on capital investment projects which are largely driven by Government investments, international funding agencies supported projects and the risks due to the cyclical nature of such investments, TCE offers annuity based services to clients through unique delivery models tapping into the operational expenditure budgets of global clients.

Services offered include:

- Dedicated Engineering Centres
- Asset digitisation and management
- Remnant/Residual Lifer Assessment Refurbishment/Brownfield/Capacity expansion
- Retrofit for Emissions Control
- Renovation & Modernisation/ Rehabilitation
- Plant betterment studies
- Environment/Emission/Energy Assessment studies
- Outage management
- Value Engineering solutions for Owners, OEMs, Utility Majors, DECs

The service vertical's share in the overall revenue this fiscal was around 13-15%. We entered into partnership with two companies in the Industrial Internet of Things space for engineering data analytics applications and related physical assets. Furthermore, we completed digitisation and modeling of a European facility in a Brownfield environment.

OUR PEOPLE

TCE employees play a critical role in increasing long-term value creation for relevant stakeholders. Fundamental to the Company's strategic objectives, client promise and operational performance it delivers is a skilled, engaged and motivated team.

There is a strong emphasis on providing comprehensive training and development opportunities to develop/reskill existing employees, train new recruits to meet international requirements and keep a multi-talented workforce engaged and utilised.

Hiring talent

The engineering consulting environment is continuously changing and customer's requirements are also changing. In the industry 4.0 era, the need to learn, unlearn and relearn is critical for the business. While the strong fundamentals in domain expertise arise from the rich experience of mid-level and senior employees, the continuous inflow of fresh talent is critical for the business. TCE in cognizance of this engineers from campuses each year and puts them through a rigorous training programme, the Young Engineers Development Programme. (YEDP).

TCE believes in encouraging equal opportunities of growth. Thus, it ensures that fair hiring practices are built into the Talent Acquisition process. The right candidates are sourced in line with industry, client and project requirements which helps imbibe diversity of ideas, culture, and experience. The continuous challenge however is the emergence of new areas of practices in the industry, bringing about a talent crunch. For instance, India's focus on 100 Smart City development projects called for increasing resources in the architectural and town-planning space.

The hiring process focuses on balance between organisational priorities, business requirements and employee aspirations.

2,900

WORKFORCE STRENGTH FY 2016-17

Work accomplishment

The stringent governance framework and organisation structure, helps the workforce to leverage its core competencies and develop varied skills. Each Business Unit has its operations delivered through Centre of Excellence as main location, through Delivery Centres established for key accounts or working at client's site with their systems and teams. This requires the workforce to stay agile and responsive to the dynamic global environment and stay relevant to the customers' requirements. The Rhythm 2.0 business process engineering exercise included a track focusing on People Excellence to align its Human Capital management to TCE's strategic goals.

TCE's leadership team guides the employees through deliberations and collaboration of cross-functional teams. Such collaborative teams also include clients-side teams as most of TCE's projects are complex in nature requiring multi-disciplinary expertise. The teams are oriented and developed to align their individual performance goals to the organisational goals and work towards achieving them with greater customer orientation and business acumen.

OUR PEOPLE (Contd.)

Learning , Development & Talent Management

TCE is among the few companies that has the largest, readily deployable, multi-disciplinary engineering talent. From the employee perspective, TCE is also among the few companies that leverages core engineering expertise from all discipline. A single project at TCE calls upon the skills of mechanical, civil, instrumentation, environment, etc. TCE's strategy of engaging with marquee clients across the globe as an outsourced engineering arm, provides TCE's talent to evolve and upgrade themselves within the client's ecosystem. With new projects come new learning opportunities and the exposure to new standards and systems relevant to various countries. This enables continuous learning opportunities for TCE employees in their core area. Several process innovations have resulted with TCE's expertise in solving client's unique problems.

TCE has put in place extensive processes, tools and resources to continuously upgrade employee's technical, process and system capabilities. Over the years, TCE has invested in various aspects of development in state-of-the-art design engineering and PMC tools, project management certifications, etc.

At the BU level, a pool of employees with industry-specific domain, technology and process knowledge is created to ensure agility to manage growth. Additionally, cross skill training and retraining helps employees to acquire new competencies across technologies, roles and functions.

At the project level, workforce continuity is facilitated through workforce rotation across sectors within BUs, identification of back-ups for key roles and a structured handover process.

CORPORATE

Soft skill/Behavioural Training

Leadership Development Programmes

Strategic Development Initiatives

3D Tool Training

Project Management Certification

Cross Cultural Orientation

Risk Assessment

BUSINESS UNIT

Continuing education to build competency

a) Technical

b) Functional

TECHNOLOGY

New competencies/ technologies

Discipline specific training to Improve Delivery Execution

Content creation for Technical Training

Workforce Engagement

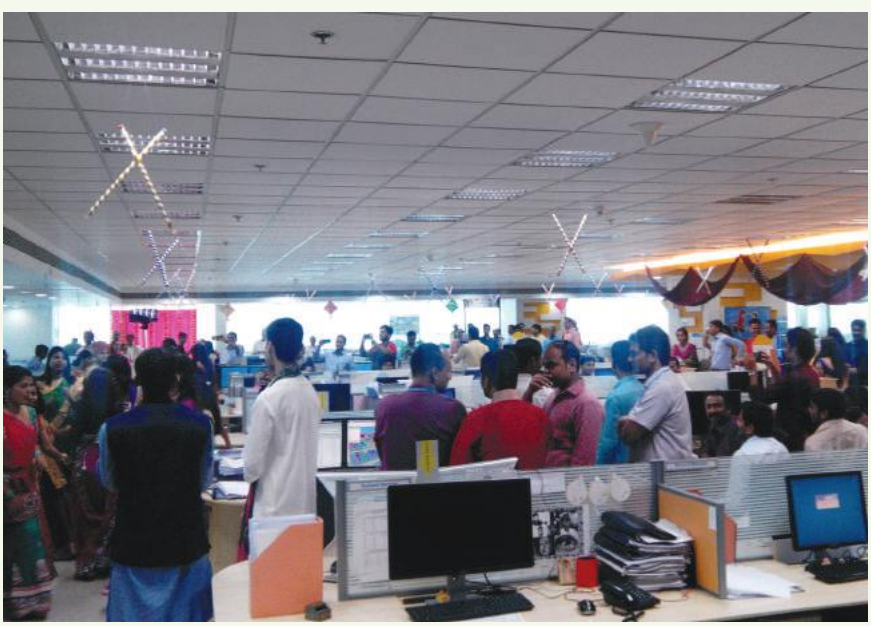
TCE's culture is centred on open communication with the employees. The last few years have seen significant changes in the way the organisation communicates to have a connected workforce. The Company has mechanisms to enable open communication and foster high performance orientation.

This is driven through face to face communication and the intranet platform. With the adoption of a top-down, bottom-up and peer-to-peer communication approach, various fora of communication, continuous learning, knowledge sharing, collaboration, innovation and empowerment are encouraged, leading to a culture of open communication.

Key engagement tools:

- Townhall
- Channel of Communication
- Project review meeting
- In-house newsletter
- E-Mailers
- SMS Groups
- Intranet

TCE has a young vibrant workforce supported by senior and mature talent. The average age ranges between 34-36 years. Several employee engagement initiatives are conducted every year making work at TCE fun and engaging. Sports, entertainment, volunteering, contests and other department-wise team engagement activities keep a diverse workforce engaged and happy. Several women-friendly policies have been introduced to help women employees.



Employee Health & Safety

Security and accessibility for the workforce are ensured across various offices and sites by corporate and location specific administrative functions. TCE has set up a formal Safety, Health and Environment policy at the Company level, which acts as a guideline for safety, security and health relate processes and practices.

Medical facilities, availability of an in-house medical practitioner and other structured policies and process to address employee grievances are in place.

Workplace safety is a priority and mock drills and safety training is conducted at regular intervals.

OUR COMMUNITIES

Upholding the Tata tradition of giving back to the society, TCE lives up to the philosophy of Jamshetji Tata, 'In a free enterprise, the community is not just another stakeholder in business, but is in fact the very purpose of its existence.'

The ecosystem of TCE's communities include its customers, partners, suppliers, employees and the society at large. TCE's fundamental principle in enriching the communities it serves is sharing its core skills and capabilities to benefit society. With every project the Company undertakes, TCE reviews the value creation in terms of long-term sustainability for its clients and communities.

TCE's CSR focus areas include:
1. Education
2. Health care
3. Sustainable Livelihood
4. Infrastructure Development

The nature of the Company's CSR program is grouped as -

a) Flagship programs driven from the Corporate office
b) Collaborative participation in programs with clients or Tata Group
c) Location specific short term programs enabling structured corporate volunteering

All programs are identified and deliberated within the CSR team and the CSR working committee. The plans are discussed internally with senior management and presented to the CSR Committee. The Committee deliberates on the proposal and approves the programs. The Committee also guides & approves the program evaluation and monitoring.

The programs are reviewed periodically with the working partners and the beneficiaries and course corrections adopted in consultation with the apex CSR Committee.

75
CHILDREN OF MIGRATORY WORKERS GET SCHOOL ON WHEELS

1,410
ADOLESCENTS GET CAREER COUNSELING

54
TOTAL VOLUNTEERING PROGRAMMES (AS OF MARCH 2017)

2,700
TOILETS IN RURAL GUJARAT

639
TOTAL VOLUNTEERS (APRIL 2016-MARCH 2017)

12,338
TOTAL VOLUNTEERING HOURS

Some of the ongoing programmes are:

Programme	Details	Beneficiaries
Education		
School of Wheels	Converted a school bus into a mobile classroom to provide bridge schooling to children who have no access to education. The bus serves as a classroom cum mobile library to children	3 batches of 75 children of migratory workers who have no access to any form of education
Career Aware	Personality profiling and counseling on aptitude and career planning. This is to provide a direction to young students so that they do not drop out of school	1,400 students in Class IX to Class X in 47 night schools run by the municipality
Health		
Swachh Bharat Mission	A collaborative effort with a client to provide project management consultancy to construct 2,700 toilets in rural Gujarat	2,700 toilets in rural Gujarat
Sustainable Livelihood		
	Adoption of a tribal village near Mumbai to provide the village with means to earn a decent living and improve living conditions	63 families in the village Khoripada, are assisted with sustained income generation means and the necessary infrastructure to improve quality of living
Infrastructure		
	Working with the Tata Relief Committee to provide design and engineering services for the relief and rehabilitation of post-flood Uttarakhand	Several villages in Uttarakhand are being rehabilitated by providing schools, colleges and vocational centres
Volunteering		
	Various social programmes initiated such as counseling, skill building - (AutoCAD training), capacity building, blood donations, health and hygiene awareness, remedial classes	Several localised programmes during the Tata Engage Volunteering months to run short-term programmes to benefit people from all walks of the society

OUR COMMUNITIES (Contd.)

Khoripada: Creating a model village

In 2015, we adopted the Khoripada village in Maharashtra, a tribal hamlet near Mumbai. The idea was to provide sustainable livelihood means for the hill tribes who make a living in hostile terrain with no infrastructure. TCE took an integrated approach based on the requirements in the region. A baseline survey was done to ascertain the existing status and create a broad-based, phased approach to the CSR intervention. Based on the survey results, four core areas were identified – Governance, Training & Awareness, Water Management & Sustainable livelihood.

Interventions:

Focus Area	Rationale	Action Taken	Agenda
Governance	A strong governance system was required to hand hold the villagers to take responsibility for their own affairs	Self-Help Groups have been established a) Women's SHG b) Village SHG c) Youth SHG Capacity building on SHG management was provided	Empower with mutually beneficial financial assistance, crop management, youth self employment, bank accounts, identity cards, certificates etc. to tap into existing welfare schemes
Training & Awareness	With TCE's investments in infrastructure & livelihood means, a prerequisite was skills and awareness to manage their affairs independently	a) Exposure visits to other farms & villages b) Crop/plantation management training c) Drip irrigation training Water management practices d) Establishment of village information centre (govt. schemes, agri-practices etc.) e) Total 49 person days of various trainings	Improved yield in crops Efficient management of floriculture Farm practices to nurture tree plantation Create water bodies for sustained water source
Water Management	The biggest problem was the complete lack of water sources post the monsoon due to the hilly/ rocky terrain that cannot hold natural rain water	a) Rain water harvesting tank for capturing water post monsoon b) 27 farm ponds to create smaller water sources for floriculture post monsoon c) Drip irrigation systems to distribute water across tree plantations from well	The water management is being done in a phased manner Geological survey was done to identify prospects of a second well for irrigation Leverage existing contours to retain top soil and create water bodies
Sustainable Livelihood	The village was characterised by migration to urban areas for short-term employment due to lack of livelihood means within the village	a) 23 families cultivating Jasmine on six guntha land b) 23 families cultivated Mango plantations c) 4 landless families provided with backyard poultry management d) Trained youth from within the village and deployed for managing drip irrigation venture as a paid service to the village	The floriculture and forestry intervention commenced for 50% of households as the water management facilities had to be managed simultaneously. The labour for the infrastructure was sourced from the village

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AUDITORS

Deloitte Haskins & Sells LLP, Chartered Accountants

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Engineering a better tomorrow

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