Public Sector Enterprises

A. National Research Development Corporation (NRDC)

B. Central Electronics Limited

सत्यमेव जयते

Public Sector Enterprises

1. NATIONAL RESEARCH DEVELOPMENT CORPORATION (NRDC)

1.1 Introduction

National Research Development Corporation (NRDC) is a Government of India enterprise, under the Administrative control of Department of Scientific & Industrial Research (DSIR), established in 1953 under section 25 now section 8, of the companies act. The main objective is to promote, develop and commercialize technologies/ know how/ inventions/ patents/ processes emanating from various national R&D institutions. The Corporation offers its services through-out the country in improving the Nation's manufacturing base with innovative technologies specially suitable for our entrepreneurs and conditions. It acts as an effective Interface for translating R&D results into marketable products. Over the last more than six decades of its existence, the Corporation has forged strong links with various R&D organizations both within the country and abroad and pursued bringing inventions and innovations to commercial fruition. The Corporation is recognized as a repository of a wide range of technologies and has licensed technologies to over 4950 entrepreneurs spread over almost all areas of industry and has provided assistance for filing of 1700 patents.

1.2 Profit

The highlights of the performance and the financial result for the financial year ended 31st March 2017 are given below:

Performance Parameters	2016-17	2015-16 (Rs. in lakhs)
Gross Income	2627.62	1968.77
License Fee/Premia from Technology Licensing & Royalty	2148.99	1364.20
Consultancy	380.06	383.82
Profit after tax	86.38	5.21
Paid up Share Capital	441.81	441.81
Reserves & Surplus	469.64	383.25
Net Worth	911.145	825.06

1.3 Processes assigned and licence agreements concluded

The Corporation continued to lay emphasis on broadening and strengthening the technology resource base by nurturing long-term relationships with R&D institutions as well as universities, technical organiza-tions, industries and also individual inventors. This endeavor is reflected in the Corporation's signing of 41 new MOUs / MOAs / Agreements with Institutions / Organizations for intellectual property protection, technology commercialization, technology consultation and other value-added services. Some of the major institutions are as under:

- The Technology Business Incubator (TBI) Centre for Incubation and Business Acceleration, Goa.
- Institute of Wood Science and Technology, Bengaluru
- iB HUBS, Hyderabad
- University of Horticultural Sciences, Bagalkot
- Indian Jute Industries' Research Association (IJIRA), Kolkata

- Defence Research and Development Organisation (DRDO), New Delhi
- National Thermal Power Corporation Limited (NTPC), New Delhi
- Guwahati Biotech Park (GBP), Assam

Process Assigned

During the financial year 108 new processes were assigned to the Corporation, 30 on Exclusive basis as mentioned in and 78 on Non-Exclusive basis as compared to 47 processes in the previous year. Some of the commercially important processes assigned to the Corporation from various research institutes, universities were:

Central Council for Research in Ayurvedic Sciences, New Delhi

- Shunthi Guggulu – anti-arthritis tablet

CSIR-North East Institute Science and Technology, Jorhat

- Anti-arthritis herbal oil for arthritis

CSIR-Centre for Cellular and Molecular Biology, Hyderabad

- Process for the preparation of novel porphyrin derivatives and their use as PDT agents and fluorescence probes
- DNA markers for assessing seed purity

Central Sericultural Research & Training Institute, Mysuru

- Tray washing cum disinfection machine for sericultural applications

CSIR-Central Building Research Institute, Roorkee

- Acrylic water based coating for the protection of concrete structures
- Beneficiation of phospho-gypsum

Major Technologies Licensed

The Corporation managed to sign 36 licence agreements during the year compared to 21 licence agreements signed in the previous year. Some of the major processes/technologies licensed by the Corporation in the financial year were:

Indian Institute of Horticultural Research, Bengaluru

- A process for preparation of ARKA vegetable foliar spray formulation

Central Council for Research in Ayurvedic Sciences, New Delhi

- Ayush-82–(Anti-diabetic formulation)
- Anti-arthritis – herbal formulation of arthritis
- Ayush SG – (For rheumatoid arthritis)
- Ayush-64

Calcutta University, Kolkata

- Activated charcoal filter for effectively reducing para-benzosemiquinone from the mainstream cigarette smoke

Vector Control Research Centre (VCRC), Puducherry

- Mosquito larvicidal formulation of bacillus thuringiensis Var. israelensis 5.0% A.S. (Strain VCRC B-17, Serotype H-14)

Central Sericultural Research & Training Institute, Mysuru

- ANKUSH–a new silkworm bed disinfectant
- POSHAN–a multi-nutrient formulation for correcting the nutrient deficiencies in mulberry

CSIR-North East Institute Science and Technology, Jorhat

- Anti arthritis – herbal formulation for arthritis
- Anti arthritis – herbal oil for arthritis

1.4. Lumpsum Premia and Royalty

Corporation's consolidated Lumpsum Premia & Royalty income is Rs. 2148.99 lakhs as compared to Rs. 1364.20 lakhs in the previous year. The growth in Lumpsum Premia & Royalty collection is 57.53 % over the last year. The royalty received was from both the NRDC licensees and PATSER projects.

1.5. Consultancy/Export of Projects and Services

The Corporation has been offering consultancy services in the following fields :

- Technological upgradation for the SMEs–identify technological gaps, scouting for appropriate technology and partnering with R&D institute for developing the solution
- IP Consultancy services–Patent Datamining, Search and Analysis, patent drafting, filing and prosecution, patent landscaping, FTO analysis, IPR policy, Audit, Training
- Project consultancy–undertaking and executing projects in India and abroad particularly in developing countries.

Pilot Research Project for Tomato Production in Ghana

The Corporation is implementing a project for setting up a "Pilot Research Project for Tomato Production in Ghana" in collaboration with CSIR, Ghana, Ministry of Science, Technology and Environment, Govt. of Ghana with a financial support of US$ 2.08 million from MEA, Govt. of India.

The objective of the project is to conduct the problem oriented applied research in various agro-climatic regions of Ghana with a view to evolve effective cultivation techniques and measures to achieve higher yield of good quality tomato under Ghana conditions. The project is being carried out at three locations in Ghana viz. Kumasi, Ada & Navrongo. At Kumasi the first site the project has being carried out with CSIR-Crop Research Institute, Kumasi. Project already completed in open Field and Polyhouse at Kumasi site. The second site at Ada, the project is being carried out with CSIR-Crop Research Institute, Kumasi and Agriculture Extension Division, Ada. Harvesting of tomatoes on open field and Polyhouse is in progress at Ada site. The third site at Navrongo the project is being carried out with Irrigation Company of Upper Region (ICOUR), Ghana Harvesting of tomatoes.

Indigenous Consultancy

i. Preparing a "Technology Foresight Report on Nanotechnology Applications in the Oil & Gas Exploration" for ONGC-Energy Centre, New Delhi

NRDC undertook a consultancy project on preparation of "Technology Foresight Report on Nanotechnology Applications in the Oil & Gas Exploration" for ONGC-Energy Centre, New Delhi in association with Centre for Knowledge Management of Nanoscience and Technology (CKMNT) Interna-tional Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad. Since, Nanotechnology has tremendous potential to develop enabling technologies that can address various challenges related to improving the oil recovery from new and existing reservoirs, the economical exploitation of unconventional hydrocarbons, modernizing infrastructure and enhancing overall efficiency of E&P industry. Realizing the potential of nanotechnology interventions in E&P operations and following deliberations with ONGC, the report on 'Technology Foresight Report on Nanotechnology Applications in Oil & Gas Exploration' will focus on following areas: (i) nanofluids (ii) nanocoatings and (iii) nanomembranes. The report is expected to cover the current status of developed/being developed and commercialized nanotechnologies, which would help ONGC to explore the possibilities for further licensing the available technologies for their adoption or establish R&D collaborations to develop relevant nanotechnologies and prepare a roadmap for nanotechnology implementation in all areas of E&P operations.

ii. Drafted Policy on Intellectual Property Rights Management & Technology Commercialization of National Institute of Ocean Technology (NIOT), Chennai

The Corporation prepared the IPR policy document for management & commercialization of Intellectual Property generated in NIOT, Chennai for providing IP protection services and commercialization of the technologies developed in their institute.

iii. Start-up India Initiative of DIPP

"Start-up India" is an initiative of Department of Industrial Policy and Promotion (DIPP),

Government of India, designed for fostering innovations, create jobs and facilitate investments. Start-up India receives applications from all over India for getting recognition (as Start-ups) for further availing proposed benefits under this scheme including the three year tax benefits.

DIPP has given the responsibility to NRDC for technically assessing these applications for recognizing start-ups and recommending the eligible start-ups for tax exemption and other benefits. Till date more than 4000 aspirants have applied for recognition at Start-up India Portal. Total 2401 start-ups have been successfully received the recognition certificate. As notified, for availing tax benefits, the eligible applications are further reviewed by an Inter Ministerial Board (IMB) chaired by JS, DIPP. NRDC evaluates the applications on the basis of norms given by Start-up India Initiative and submits the report regarding the same to Inter Ministerial Board (IMB) for final decision. NRDC has submitted report for more than 400 cases upto 10th IMB meeting. Based on recommendations of assessment by NRDC, the IMB has approved 50 Start-ups for availing tax benefits.

iv. Global Cleantech Innovation Programme (2016) - India

Promoting Green Technological Innovations

With an objective to identify the most promising entrepreneurs across the nation Global Environment Facility (GEF) in collaboration with United Nations Industrial Development Organisation (UNIDO) and Ministry of Micro, Small and Medium Enterprises, (MoMSME), Government of India, organised the India Cleantech Open Competition. This platform is meant to provide Small and Medium Enterprises (SMEs) and the Entrepreneurs with the initial facilitation and support needed to launch and create a successful and sustainable clean technology ventures and start-ups. An ecosystem approach is followed, whereby a common platform was established, policy frameworks were strengthened, and local capacity was built to forge a close partnership between the Government, Academia, Business and various other key stakeholders including the State and the non-state players. The programme was designed to promote the start-ups, which are engaged in the promotion of clean technologies, as well as the local entrepreneurial ecosystem and policy frameworks. The aim was to promote Clean Technology Innovations and Entrepreneurship in selected SMEs in India through the Cleantech Innovation Platform and the Entrepreneurship Acceleration Programme.

Based on the experience that National Research Development Corporation has in technology assessment, transfer, commercialization and other support activities for nurturing innovations, NRDC has been selected for the Validation of Technologies of the Start-ups participated in the programme by UNIDO, wherein NRDC submitted its observations and recommendations for all 19 semifinalists chosen by the jury across the country.

In final round of selection four of these have been selected and recommended to participate in final global competition held at Silicon Valley, California, USA. Cellzyme Biotech, GIBBS and Atomberg Solutions participated and presented their innovation to world forum of this Global Cleantech Innovation Programme, and GIBBS and Atomberg stood first and second.

1.6. Promotional activities

During the 12th five year Plan the Corporation has taken up two new schemes viz.

1. Programme for Inspiring Inventors and Innovators (PIII)
2. Programme for Development of Technologies for Commercialisation (PDTC)

1 Programme for inspiring inventors and innovators (PIII)

The programme is planned to encourage the innovators/inventors in developing new innovative technologies and products and tap these technologies for Corporation's business activities. To achieve this Corporation carries out various

activities like awarding meritorious inventions, protection of IP's, evaluation of technologies, knowledge management and providing techno-commercial support to the new innovations/ technologies etc. The activities carried out under this programme are summarized below:

1.1 NRDC Awards for Meritorious Inventions

The Corporation under PIII DSIR Grants-in-Aid Programme gives tax free awards in three categories, i.e., Innovation, Societal & Budding Innovators Award to Indian Nationals for their meritorious inventions with an objective to encourage inventive talent in the country.

These awards acknowledge the efforts of inventors and recognise their pioneering work. The recognition makes the awardees more competitive and innovative in their field and inculcates positive emotions such as pride, honour, and gratitude. These awards in some way encourage the awardees to continue to excel in their talent domain.

A total of four awards have been announced for NRDC Meritorious Invention Awards of the Year 2015 by the Prize Award Committee. The cash awards amounting to Rs. 16 lakhs were distributed along with shields and certificates to the 20 Awardees of NRDC Meritorious Invention Awards of the Year 2015 in the field of agriculture, environment, health and engineering science during Innovate India Programme.

1.2 Contest for Demonstrating Innovative Prototypes for Start-ups

NRDC organised a Contest for Demonstrating Innovative Prototypes for Start-ups during the two-day conference on "Leveraging Innovation Ecosystem for Accelerating Start-ups".

After a scrutiny of about 85 applications received for the contest 14 semi-finalists were invited for demonstration and final jury round and seven were selected for the first, second, third prize (one each) and consolation prizes (four).

The first prize of Rs. 50,000 was awarded to Sri Sivasubramaniya Nadar College of Engineering, Chennai for Mass Screening Device for Osteoarthritis. This device detects arthritis at an early stage using electro arthrography (EAG) signals.

The second prize of Rs. 40,000 was awarded to Global Institute of Technology, Jaipur for Wrapper Picker. It is a battery-operated motorised device which can automatically collect waste without manual effort.

The third prize of Rs. 30,000 was awarded to Meerut Institute of Engineering and Technology, Meerut for Low-cost Robotic Arm (Made in India). The robotic arm is fully metallic and can be used for pick-and-place purpose in industry, and can perform many other industrial application such as drilling, welding, and soldering.

First Consolation prize of Rs. 10,000 was awarded to Usha Mittal Institute of Technology, Mumbai for Low-cost Shoulder CPM. It is a light-weight device with optimum combination of digital technology, ergonomic design and compact dimensions.

Second Consolation prize of Rs. 10,000 was awarded to National Institute of Health & Family welfare (NIHFW), New Delhi for Immun-ochromatographic (ICG) Test Strip. The ICS test utilises a gold-labelled antigen instead of a gold-labelled antibody and the antibodies and nano gold particles used in the study are developed in-house and could thus reduce the cost of strips.

Third Consolation prize of Rs. 10,000 was awarded to SRM University, Tamil Nadu for Patient Monitoring using Wearable Wireless Sensors. The device is a real-time monitoring and notification system which incorporates Wireless Body Sensor Networks (WBSN) to observe especially the old and unwell.

Fourth Consolation prize of Rs. 10,000 was awarded to Innovation and Incubation Centre Gandhi Nagar of TORCH-IT, Torch for visually impaired.

1.3 Intellectual Property Facilitation and Management and IPR Consultancy

Creativity and innovation plays a vital role in the growth and development of any knowledge economy. The system of Intellectual Property

सत्यमेव जयते

Rights foster creativity and innovation and thereby promote entrepreneurship and enhance socio-economic and cultural development. In a knowledge based economy, creation, acquisition, protection, application and management of Intellectual Property are effective ways for any industry or organization to enhance growth and competitiveness. It has therefore become necessary to protect our intellectual property in face of stiff global competition.

The Corporation continued to provide financial, technical and legal support to protect inventions and technologies developed by various Universities, R&D Institutes, etc. for filing patent applications in India during the financial year 2016-17. Further, before filing any patent application, the Corporation conducts State of the art patent Search for establishing the novelty aspects of the invention. The various services provided and programmes undertaken during the financial year 2016-17 are:

(i) **IP Protection:** The Corporation in its pursuit of protection of inventions and technologies developed by scientists, researchers and individual inventors has extended financial and technical assistance for filing 45 patent applications (Annexure-IV) in India received from various Universities, R&D Institutes, etc. in various sectors of technologies.

(ii) **Patent Search Facility:** The Corporation has been catering to the requests received from various Universities, R&D Institutes, individual inventors, etc. for conducting the state of the art patent searches. During the financial year 2016-17, 51 prior art searches have been conducted by the Corporation.

(iii) **IPR Seminar/Workshop/Training:** The Corporation has reached out to various Universities and R&D Institutions for creating awareness amongst scientific fraternity about the importance of protection of IP assets in the knowledge era by organizing five awareness programmes on "Intellectual Property Rights" across India in collaboration with the Indian Patent Office. These programmes have been widely appreciated by the participants representing different sections of the society.

1.4 NRDC – Innovation Facilitation Centre (NRDC-IFC)

The Corporation under PIII DSIR Grants-in-Aid Programme has set up four NRDC – Innovation Facilitation Centres in various R&D Institutions to promote innovation related activities in the Universities, NIT's, Autonomous Institutions & Academic Institutions across the country.

Recently, two more Institutions have been selected for establishing NRDC – Innovation Facilitation Centres, One at Gujarat Technological University, Ahmedabad, Gujarat and another at Indian Institute of Technology, Kanpur, Uttar Pradesh in the financial year 2016-17.

The established centres have sensitized the students, research scientists and faculty members about the effective management of Intellectual Property and management, technology transfer and commercialization related issues by providing information through Seminars and Workshops on Innovation, Intellectual Property Rights and Technology Transfer in the selected Institutions.

1.5 MoMSME-NRDC intellectual property facilitation centre (IPFC)

MoMSME-NRDC IPFC, BENGALURU

NRDC Office at Bengaluru was setup in the year 1992 to liaison with the various R&D Organizations and large number of licensees in the Southern States of the Country. Presently, one Technical Officer, one Trainee and two Staff are working in this office. The Technical Officer is also serving as the Coordinator of MoMSME-NRDC IPFC Project.

During financial year 2016-17, the MoMSME-NRDC IPFC, Bengaluru has facilitated entering in to collaboration with the following six R&D institutions by way of signing Memorandum of Agreements for providing intellectual property protection and technology commercialization services:

1. NITTE Mahalinga Adyanthya Memorial Institute of Technology, Nitte, Karnataka
2. Centre for Nano and Material Sciences, Jain University, Bengaluru, Karnataka
3. University of Horticultural Sciences, Bagalkot, Karnataka
4. Institute of Wood Science & Technology, Bengaluru, Karnataka
5. JSS University, Mysuru, Karnataka
6. Sri Venkateswara University, Tirupati, Andhra Pradesh

The MoMSME-NRDC IPFC was able to acquire two new technical know-hows for commercialization from various R&D sources and concluded five licence agreements with lumpsum premium earnings of Rs. 11.25 lakhs. Some notable technical know-hows licensed by the MoMSME-NRDC IPFC Bengaluru are Poshan-A multinutrient formulation for correcting the nutrient deficiencies in mulberry, 5 Jackfruit based value added products, Ankush-New Sikworm bed disinfectant, Cocoon harvester from plastic collapsible mountages and Arka vegetable foliar micronutrient formulation. The IP Facilitation Centre has processed 11 patent applications on consultancy basis earning total revenue of Rs. 8.57 lakhs. The Centre has also collected royalties of Rs. 9.17 lakhs from various licensees located in South India during the financial year 2016-17.

The IP Facilitation Centre has participated in many other technology promotional activities and IPR Awareness Programs organized in South India. Guest lectures were delivered in many of these programs on technologies/processes ready for commercialization and also on intellectual property rights for creating awareness on the various tools available for protection. The Centre has also facilitated and guided several innovators from industry, academia, R&D, etc. for patent searching, patent analyzing, filing of IP protection, etc. of their inventions during the financial year 2016-17.

MoMSME-NRDC IPFC, Vishakhapatnam

The Corporation had proposed setting up of Intellectual Property Facilitation Centre to MoMSME with a total funding of Rs. 1 crore. MoMSME sanctioned the project for setting up at Vishakhapatnam at Andhra University College of Engineering Campus with a joint funding of MoMSME, NRDC in the ratio of 65:35 percent.

The objective of this IPFC is to enhance awareness, promotion and protection of intellectual properties generated by MoSMEs and academia and to facilitate filing of patents, designs, trade-marks, copyrights and geographical indications, etc. IPFC also facilitates commercialisation of IPs and technologies developed by various public funded research organisations amongst the entrepreneurs, start-ups and MoSMEs.

The Corporation has fully equipped the MoMSME-NRDC IPFC to function as per the mandate of the project.

2. PROGRAMME FOR DEVELOPMENT OF TECHNOLOGIES FOR COMMERCIALISATION (PDTC)

The programme aims to add value to the lab-scale technologies developed by the universities/research institutes/organizations, dissemination of the information and promotion of entrepreneurship development and appropriate innovative technologies in rural and north-east regions. Under this scheme the Corporation carried out various activities like Development of Innovation Portal, Value addition through preparation of Basic Engineering Design Package (BEDP), Market Surveys, and dissemination of information through exhibitions/ seminars/workshops etc., promotion of indigenous technologies abroad through showcasing of indigenous technologies. The various programmes undertaken in this scheme are:

2.1 Technology value addition

Basic Engineering Design Package (BEDP)

The preparation of Basic Engineering Design Package carried out by the Corporation is a very important value addition activity for laboratory scale technologies. The package provides

information on the plant and equipment, raw material and the product, etc. which helps the entrepreneurs in decision making as well as implementation of the project. It requires a detailed study for working out the final process scheme, which can be obtained through series of simulation of the laboratory scale process and then incorporating required engineering input so that the process is workable. Once the BEDP is prepared based on the data the feasibility study and Detailed Project Report (DPR) can be prepared. With these reports it becomes easy for the entrepreneur to carry out detailed engineering for setting up the commercial plant. The reports also help the Corporation in planning for marketing of its technologies.

During the year, BEDP on the following technologies were conducted through professional empanelled consultants:

1. Production of non-alcoholic naturally carbonated beverages from fruit juices
2. AUV-150 – autonomous underwater vehicle
3. Herbal gulal (novel process)

Market Surveys

Market surveys are of considerable significance to the process of technology transfer. It makes the technology package more attractive to entrepreneurs. During the year 2016-17, market survey reports on the following technologies were conducted through professional empanelled consultants :

1. Value added products of tender jackfruit
2. Rice hybrid technology
3. Device and methods for determining elemental identity and analysis on moving target from a variable stand off distance
4. Portable cable way for agricultural applications
5. New oxygen-deficient Perovskite nano-material for reversible CO2 capture
6. Production of non-alcoholic naturally carbonated beverages from fruit juices
7. Ready to eat wholesome nutrient bar specific to osteoporosis
8. Multiple PCR water testing kit for simultaneous detection of E. Coli, Yesinia, Entercolitica and Aeromash yerogslillia in drinking water
9. Herbal soft rink
10. AUV-150 underwater vehicle
11. Recycling of plastic waste into tiles
12. Thermo-electric solar dehumidifier and low cost peltier based refrigerator
13. Long afterglow phosphor powder
14. Herbal gulal (novel process)
15. LPG sweetening catalyst
16. Production of ultra-low sulphur diesel
17. US grade gasoline and high purity benzene
18. Preparation of water soluble turmeric colourant (odourless) formulation (WTCF)
19. Shelf-stable & ready to eat foods thermo processed in retort pouches (non-veg. & veg. foods)
20. Virgin coconut oil preparation
21. Multigrain based fortified snack
22. Modified atmosphere packaging of minimally processed vegetables
23. Breast cancer kit
24. Vaccine against leishmaniasis
25. 10 HP small tractor
26. Solar tree/solar umbrella/solar park
27. Geopolymer cement
28. Graphene coated steel

Development of Technologies for Commercialization

The technology on Auto Dipper developed by Shri Lalit Mohan Sharma, Bhatinda was assigned to the Corporation in 1998 for commercialization. The technology has been licensed to 6 parties. Govt. of Haryana has made it mandatory for installing Auto Dipper in vehicles. Thus it is proposed that the device should be tested for validation by the concerned govt. agency i.e. International Center For Automotive Technology (ICAT), Manesar. The matter was discussed in the committee for Techno-commercial and Priority Projects and it was suggested that the testing of Auto Dipper by ICAT should be taken up under the Priority Projects. Thus, financial assistance under Priority Projects has been provided for testing of Auto Dipper by ICAT. The project is in progress with testing being done by ICAT and will be completed shortly.

Promotion of Innovation in Rural & North-East Region

The Corporation with an objective to create employment opportunities and capacity building of development agencies for skill up-gradation through the application of innovative technologies in rural and backward areas carried out the following activities during 2016-17.

(i) EDP on "Women Entrepreneurship Development through skill training on semi automatic paper creasing machine for the production of eco-friendly bags for replacing plastic bags" in association with Forum of Scientists, Engineers & Technologist (FOSET), Kolkata-700087 and about 40 candidates were benefited during this programme.

(ii) EDP on "Using organic farming to improve food, nutrition and income security for rural poor farmers" implemented in association with Annapurna Sevabhavi Sanstha, Chikhali Tal. Karad Dist. Satara, Maharashtra-415106. EDP was conducted at five villages i.e. Kiwal, Nigadi, Shamgeon, Chikhali and Masur from Karad Tehsil of Satara District of Maharashtra and about 260 participants were benefited during this programme.

(iii) EDP on "Solar Energy Solution in Remote Tribal Areas by Tribal Youth" implemented in association with Action in Rural Technology and Services (ARTS) Srikakulam, Andhra Pradesh. EDP was conducted at Peddapet (Vill. & Post); Burja Mandal; Srikakulam district of Andhra Pradesh and 20 candidates were benefited during this programme.

(iv) EDP on "Training and demonstration on Zero energy cool chamber for entrepreneurship development in fruits and vegetable storage" implemented in association with Innovative Change Collaborative (ICCo), Green Park Extension, New Delhi-110016. EDP was conducted at three villages of four districts each of Assam and about 240 candidates were benefited during this programme.

(v) EDP on "Developing entrepreneurship for disinfection of silkworms rearing houses and silk cocoon harvesting" implemented in association with Central Seri -cultural Research & Training Institute (CSRTI), Central Silk Board, Srirampura, Manandavadi Road, Mysuru, Karnataka-570008. About 100 candidates are benefited from this programme.

Exhibitions and Publicity

Participation in exhibitions, seminars, workshops and entrepreneurship development programs are of vital importance for the creation of awareness about the activities of the Corporation and the role of the Corporation in technology transfer and technologies available with the Corporation for transfer. With this objective in view, the Corporation participated in 24 exhibitions, in India.

Publications

NRDC continued to publish its Hindi science monthly magazine Awishkar. The main objectives of the magazine are to disseminate information and create awareness about new technologies, inventions, innovations, IPR issues, etc. amongst the masses and foster the spirit of inventiveness, innovativeness and entrepreneurship in the country. Discovery of Gravitational Waves; Nanoscope; Soil Health Card; Organic LED Technology; Photonics-new applications; Indian Navigation System–NavIC; 3-D Printing technologies – new applications; ISRO's Reusable Launch Vehicle; New elements – new names; Sports Science and Technology; NASA-Space probe–Juno; Interview of Dr. J.V. Narlikar; Solar powered aeroplane–Solar Impulse-2; Entrepreneurship and Innovations; Is there fifth force in the Universe Robotic–surgery in India; Science Nobel Prizes-2016; Science Round-up-2016; Fifty years of Electronics and Computer Revolution in India; Innovation – the Engine of Human Civilization; 104th session of Indian Science Congress; Journey of Indian Science Congress; and Hydro Electric Cell. March 2017 issue was focused on Solar Energy.

During the year NRDC resumed the Publication of Invention Intelligence, S&T English bi-monthly magazine, from the month of January 2017. The

सत्यमेव जयते

main objectives of the magazine remain the same– to disseminate information and create awareness about new technologies, inventions, innovations, IPR issues, Start-ups etc. amongst the masses and foster the spirit of inventiveness, innovativeness and entrepreneurship in the country. Two issues were published during the year. In these issues main articles published are: Innovation – the Engine of Human Civilization; Hydroelectric Cell – A Green Energy Invention; Indian researchers develop novel dressing material for faster, scar-free healing of wounds; Innovations in Healthcare Technology; NRDC – Transferring Innovative Technologies to Transform India; Nurturing 'Nervous system of Modern Technology'; 2016-The year in Science. Science Nobel Prizes – 2016; Genome Editing Re-writing the future of the Living World; 3-D Printing is Revolutionising Medical Care; Robotic Surgery: Past, Present & Future; Jaipur Foot: The Life changer; Nuclear Magnetic Resonance: Moving from Physics to Chemistry to Medical Diagnosis; and Interview of Dr. Girish Sahni, Director General, CSIR and Secretary, DSIR, Government of India.

Regular Columns published are: Inventions & Innovations; Start-up take-offs; IPR Corner; S&T Advanced; Cross-Section (covering miscellaneous S&T topics) S&T Crossword and NRDC News.

List of other Publications

- Prize Award Conference Brochure - Leveraging Innovation Ecosystem for Accelerating Start-ups
- Citation (NRDC Meritorious Invention Awards -2014)
- Citation (NRDC Meritorious Invention Awards -2015)
- Hand Book for Innovate India - 2016
- Pamphlet on "NRDC-A Super Market for Sourcing Innovative Indian Technologies for Socio-Economic Development of Africa"

7. HUMAN RESOURCE DEVELOPMENT

The Human Resource initiatives of the Corporation during the year were aligned to the overall business strategy of the organization as well as the career aspirations of staff members. Learning and development of the workforce was a priority during the year and the focus was around leadership development for achieving better productivity and building a sales-driven environment having involvement of the staff members in the execution of the organizational strategy.

The real asset of any company is its human resource. The total manpower of the Corporation as on 31st March 2017 is 95, viz., (Group A-28, Group B-18, Group C-19, Group D-5, and other contractual engagements during the financial year 2016-17 is 25. The employee-management relationship was cordial throughout the year.

8. RIGHT TO INFORMATION (RTI)

Under the provisions of section 4 of the Right to Information Act, 2005, every public authority is required to display necessary information to citizens to secure access to information under the control of public authority in order to promote transparency and accountability in its working and functioning.

9. TECHNOLOGY ABSORPTION, ADAPTATION AND INNOVATION

Being a Section 8 company under Companies Act 2013, while a major objective of the Corporation is the promotion, development and commercialization of indigenous technologies, the Corporation itself does not carry out any R&D. However, it promotes and finances R&D on a selective basis in both laboratories and industry.

As the Company's operations do not involve any manufacturing or processing activities, the particulars required under Section 134(3)(m) of the Companies Act, 2013 read with Rule 8(3) of the Companies (Accounts) Rules, 2014 regarding conservation of energy and technology and absorption are not applicable.

10. IMPLEMENTATION OF OFFICIAL LANGUAGE

The Corporation continued to make efforts to fulfil the targets prescribed by Govt. of India in the Official Language Act and Rules framed there in

with regard to increase the use of Hindi Rajbhasha in office during the year 2016-17. Employees were motivated to use their working knowledge of Hindi in day to day official work.. All the Standard Forms, Files etc. are bilingual. Significant progress has been made in the field of correspondence, noting and drafting in Hindi. All Hindi letters are being replied in Hindi only. The Annual Report of the Corporation is being published in diglot form in both Hindi & English since 1986-87. The Corporation also publishes a popular Science & Technology monthly magazine in Hindi, entitled 'Awishkar'. To popularize the use of Hindi, the Corporation organized a "Rajbhasha Pakhwara". During the Pakhwara Hindi Noting & Drafting, Letter writing and Hindi Poetry competition was organized & cash awards were given to the winners.

सत्यमेव जयते

2. CENTRAL ELECTRONICS LIMITED

2.1 Introduction

Central Electronics Limited (CEL) is a Public Sector Enterprise under the Department of Scientific and Industrial Research (DSIR), Ministry of Science & Technology, Government of India. It was established in 1974 with an objective to commercially exploit indigenous technologies developed by National Laboratories and R & D Institutions in the country. CEL is one of the companies that utilized home grown technologies during all these years of its existence. The Company is primarily engaged in production of strategic components for defence applications of national importance, equipment for railway safety and solar photovoltaic modules and systems.

The Company has developed a number of products for the first time in the country through its own R & D efforts and in close association with the premier National & International Laboratories including Defense Laboratories. In recognition of all these efforts, CEL not only have the distinction of being a DSIR recognized R & D Company, but also has been honored a number of times with prestigious awards.

CEL has already established partnerships and linkages with various stake-holders and business associates in the areas of railways, telecom, police, power generation and distribution companies, service providers in the energy sector, public funded institutions and even rural communities through the state governments. The existing marketing channels are being consolidated and expanded harnessing the unique advantage CEL has experienced manpower in terms of its product base and PSU status.

The renewed mandate of CEL includes development and harnessing technology for (i) Solar Energy Systems and Solutions (ii) Strategic Electronic Components and systems required for Defense, Space, Atomic Energy. (iii) Signaling and Safety in Public Transport Systems (iv) Infrastructure, Eco-systems management and energy conservation and (v) Security and Surveillance in strategic establishments. CEL has been the pioneer in the country in the different areas of manufacturing & proprietary manufacturer of the many strategic electronic components for use by defense organizations in the country.

2.2 Operating Results

During the year the Company has recorded production of Rs. 302.59 Crore and sales of Rs. 291.97 Crore against the previous year's production of Rs. 215.32 Crore and sales of Rs. 211.18 Crore.

The net profit after tax is Rs. 16.82 Crore as against Rs. 8.56 Crore in the previous year.

Year	2016-17 (Rs. in Crore)	2015-16 (Rs. in Crore)
Production	302.59	215.32
Sales	291.97	211.18
Gross Margin	31.88	21.87
Gross Profit	27.36	17.88
Profit Before tax (PBT)	20.91	11.21

2.3 Major Achievements (2016-17):

- ◊ The Company has achieved highest ever production of Rs. 302.59 Crore and turnover Rs. 291.97 Crores.
- ◊ The Solar Photovoltaic Division (SPV) of the Company has achieved sales of Rs. 140.89 Crore and production Rs. 147.56 Crore as against sales of Rs. 91.00 Crore and production of Rs. 89.91 Crore in 2015-16. This growth of almost 55% of the sales value was achieved by revamping marketing structure and strategy,

supported by the Company's new state of the art module production facility.

- ◊ The Company has sold 45430 Nos. of Phase Control Module (PCM's) to Bharat Electronics Ltd.(BEL) Ghaziabad during the financial year 2016-17. The Company has secured an order of Rs. 162 Crore from BEL for supply of PCM's. The order is likely to be executed in 2 – 3 years.
- ◊ The Security Systems Group (SSG) of the Company has achieved a Sales turnover of Rs. 25.15 Crore as against Rs. 4.38 Crore in the previous year and is now looking to expand this business further in the coming year also.
- ◊ The Company achieved a turnover of Rs. 50.39 Crore from sale of Axle Counters (including Single Section Digital Axle Counter,) High Availability Single Section Digital Axle Counter (HASSDAC) and Multi Section Digital Axle Counter (MSDAC)) to Indian Railways despite tough competition from private and multinational companies.
- ◊ The Company has achieved the Gross Margin of Rs. 31.88 Crore against Rs. 21.87 Crore in the previous year. The Company has exported various Solar PV Systems worth Rs. 2.87 Crores during the year under review.
- ◊ The company has successfully developed VDU based SM reset panel for MSDAC.
- ◊ The light weight flexible modules have been developed by the Company for a range of applications including , Solar Rickshaw/Solar Golf Cart, Solar CG sheet roof /façade etc.
- ◊ There is no comments from Statutory Auditors' Report on the Accounts of the Company for the financial year ended 31st March, 2017 and the Company has received NIL comments on accounts for the year ended 31st March, 2017 by the Comptroller & Auditor General of India.
- ◊ During the year under review, to encourage employees at all levels , the Company has started paying outstanding arrears of 1997 wage revision to the employees of the company.

Company has taken up R&D projects in key areas such as:

a) Development of a range of solar applications including smart trees, flexible solar panels, BIPV solutions, portable power plants etc.
b) Development of high efficiency solar cells.
c) Upgradation of existing products of Railway Signaling systems and development of new products.

- ◊ Development of a range of components & sub-systems for defense requirements.

2.4 Swachh Bharat Abhiyan

Company has implemented Swachh Bharat Abhiyan whole heartedly. Regular cleaning drives are taken up with participation of all employees for cleanniness of both inside and outside of the factory premises. During the year under review, the Company has taken up project with Sulabh International for education and advocacy on cleanliness in the neighboring village.

2.5 Future Strategy

Future Out Look & Vision 2020

All the four areas that the Company operates in (viz. Solar Photovoltaic, Railway Signaling systems, Integrated Security & Surveillance Systems and Defense Electronics) are Per-Se high growth, core sector areas.

Solar photovoltaics (spv)

The Government of India has increased the target for implementation of renewable energy under National Solar Mission to 175 GW by the year 2022. The Company is making efforts to enhance solar PV business in Off-Grid/Grid Interactive Power Plants Defence sector, educational institutions etc. under National Solar Mission directly as well as through channel partners. The "Swachh Bharat Abhiyan" has a big requirement of solar powered water pumping systems in the remote areas of the country. Government of India is also focusing on implementation of Solar Water Pumping all over India.

CEL aims to play an important role in these efforts by focusing on the potential segment like water pumps, street lighting remote area/

rural development through solar energy etc. In this regard, the Company had earlier installed a state of the art of Module Production facility. The Company is also taking active step for development of high efficiency solar cells with the funding from its Administrative Ministry, DSIR.

In keeping with the market movement moving towards the OPEX model in the solar power generation business, the company has also ventured into OPEX based solar power plants (termed RESCO – Renewable Energy Service Company – model) and recently commenced work on its first Solar Power Plant on RESCO basis.

Railway safety & signaling systems

CEL had been engaged in design and manufacture of Railways signaling equipment such as Analog and Digital Axle Counters & Block Signaling Equipment for last 30 years.

Indian Railways is planning major investment in the area of safety as well as capacity enhancement / new lines. This is expected to result in a huge demand for signaling and control equipments. CEL is working towards further developing its own R&D as well as production facilities in these areas, with support from the DSIR.

The Company is upgrading its support network for Indian Railways, to enhance customer satisfaction. The Company has also successfully developed DAC-E-1 equipment which will be interfaced to existing equipment to run on two media i,e, copper and OFC cable.

Strategic electronics

CEL is involved in the development & production of strategic electronic components such as Phase Control Modules (PCMs) for the Radar systems, Piezo fuse assemblies for High Explosive Anti Tank (HEAT) ammunition, Concrete Vibration Sensor (CVS) for structural health monitoring , etc. The Company is making all efforts to further expand the product portfolio using state-of-the art technology for supply of strategic components.

Integrated security systems

The current security scenario in the country has made security systems (Including Baggage Scanners, DFMDs surveillance equipment, intelligent systems, Bomb detection and disposal equipment etc.) a very high growth area. There is a need for reputed and reliable Public Sector entities in these areas. The Company is focusing on this area as an important business segment for future growth.

2.6 Foreign Exchange Receipts and Outgo:

During the year under review, the Company has spent Rs. 29.88 Crore in foreign exchange as against Rs. 27.60 Crore in the previous year towards purchase of raw material, components and spares, capital goods, travel and agency commission etc. The Company has earned foreign exchange of Rs. 2.20 Crore as against Rs. 0.75 Crore in the previous year from export of its products.

2.7 Energy Conservation:

The Company continues its efforts to reduce energy consumption with the Objective of optimal use of energy resources and cost reduction to the Company. The Company has recently initiated a green campus project. Under this project, the Company has achieved its first milestone by converting its administrative complex into net zero energy complex by installation of roof top solar power plant with high efficiency solar modules complemented by a number of steps for reduction of power consumption. In addition keeping as the philosophy that "ENERGY SAVED IS ENERGY PRODUCED", the Company has taken following actions for conservation of energy:

(a) By continuous efforts Installation & upkeep of capacitor banks etc for improvement of the power factor. The Company is continuously getting the power factor about 0.99. This is a remarkable achievement even by the most stringent standards.

(b) The company has recently achieved 33% solar energy share in total consumption.

(c) Installation of lights according to lux requirement of the area /nature of work.
(d) The Company has also initiated the steps to introduce Battery Energy Storage System (BESS) and DG synchronization in its internal grid.
(e) Street lighting/Boundary Lighting has been changed over from Sodium lights to LED lights.
(f) By changing the operational practice for chiller units in Company premises.
(g) By minimizing idle running of machines during start-up through strict planning and close coordination among different activities of the plant.
(h) Replacement of flourcent tube lights with CFL's/ LED lights etc.
(i) Gradual switchover to star rated ACs.
(j) Regular maintenance of & proper supervision of system of electrical equipment switch gear & motor pump sets, LT panel for optimal performance.

2.8 Particulars of Employees:

In compliance with Section 217(2A) of the Companies Act, 1956 read with Companies (Particulars of Employees) Rules, 1975 as amended, none of the employees of the Company either employed throughout the year or employed for a part of the year was in receipt of remuneration more than that minimum prescribed in the Rules.

2.9 Implementation of Hindi, Industrial Relations:

Your Company continues to implement the Official Language policies of the Government through motivation and incentivization. Employees were imparted training in usage of Hindi in computer applications. A Hindi month has also been organized from 14.09.2016 to 13.10.2016. During the Hindi month, competitions in Hindi, in the areas of General Knowledge, Poetry & Hindi Speech were organized for workers and Officers belonging to Hindi and non-Hindi areas.

Industrial relations continued to be harmonious during the year. The Company has imparted training to the workmen and executives in their related fields, which has been helpful in development and growth of employees. Since last three years regular shop level and plant level meeting were conducted & all executives are submitting their Half yearly/ Yearly KRA for achievement of set objective/goal.

Keeping in view of the Company's growth & technology needs process of regular recruitments at various level are made by the Company. Further the Company is taking up training of employees at various levels through in-house programms as well as participating in external programms in relevant areas.

2.10 Welfare of Reserved Categories:

All Government directives relating to the reserved categories such as SC, ST, Physically Handicapped, Ex-Servicemen etc. are followed by the Company.