



Public Sector Enterprises

A: National Research Development Corporation (NRDC)

B: Central Electronics Limited (CEL)





PUBLIC SECTOR ENTERPRISES

A. National Research Development Corporation

1. Introduction

The National Research Development Corporation (NRDC) is a premier organisation, under Department of Scientific & Industrial Research (DSIR), Ministry of Science & Technology, engaged in the development, promotion and commercialisation of the R&D results / technologies emanating from Research Institutes/ Universities / Industries, etc. The Corporation provides comprehensive technology transfer services and acts as a catalyst for transforming innovative research into marketable industrial products. NRDC is a unique organisation as it is the only public enterprise wholly dedicated to transfer of technologies developed at R&D laboratories to industry. During the past more than six decades of its existence, the Corporation has developed strong links and network with various R&D organisations in the country as well as abroad for transfer of technologies. Its operations cover the entire spectrum of industrial technologies ranging from chemicals to metallurgy, mechanical engineering, electrical engineering, electronics, biotechnology and so on.

2. Profit

During 2014-15 the Corporation continued to face challenges from the competitors and changes in leadership. However, due to sustained efforts put in by the employees of the Corporation, NRDC earned


high lumpsum premium and higher recurring royalty during the financial year 2014-15. The Corporation as compared to last year deficit of Rs 170.42 lakhs earned a profit before tax of Rs 330.04 lakhs during the financial year. The financial results are given below:

Performance Parameters	2014-15	2013-14	Percentage
Gross Income	953.45*	766.20	+24.38
Premia	157.20	55.69	+182.3
Royalty	653.40	598.33	+9.2
Profit/(Deficit) before Tax	330.04	(170.42)	-

* Excluding exceptional income of Rs.4.45 crores through disinvestment of 6,000 equity shares held by NRDC in M/s. Uniphore Software Systems (P) Ltd., Chennai.

3. Process 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 organizations, industries and also individual inventors. This endeavour is reflected in the Corporation signing Memorandums of



Understanding/Agreements with 20 new organizations for assignment of technologies developed by them. Some of these organizations are indicated below:

- Indian Institute of Technology, Kharagpur
- Punjab University, Chandigarh
- Institute of Life Sciences, Bhubaneswar
- National Institute of Technology, Rourkela

Process Assigned

During the year, 47 new processes were assigned to the Corporation as compared to 68 no. of processes in the previous year. Some of the commercially important processes assigned to the Corporation from various research institutes, universities were:

- **National Institute of Ocean Technology, Chennai**
 - Coastal drifter buoy
- **Central Tasar Research & Training Institute, Ranchi**
 - Jeevan sudha—a process for the preparation of jeevan sudha for the control of virosis in tasar silkworm antherarea mylitta
 - Depuratex—a product and process for cleaning and surface sterilisation to tasar silkworm antherarea mylitta
- **Indian Institute of Technology, Kharagpur**
 - Lactic acid production from renewal sources and formation of PLA
- **Punjab University, Chandigarh**
 - Solid lipid nanoparticles

- **Institute of Life Sciences, Bhubaneswar**

- A process for preparing curcuimin encapsulated chitosan alginate sponge useful for wound healing

- **AMI Life Sciences Pvt. Ltd., Vadodara**

- Amixaine
- Anti HIV drug
- Dopamine hydrochloride
- Fenofibrate

Major Technologies Licensed

The Corporation managed to sign 40 license agreements during the year compared to 19 license agreements signed in the previous year. Some of the major technologies licensed by the Corporation in the financial year were:

- **Indian Agricultural Research Institute, New Delhi**

- Extraction of azadirachtin from neem seed kernels
- Pesticide formulation from azadirachtin
- A novel superabsorbent hydrogels

- **Neyveli Lignite Corporation Limited, Neyveli**

- Manufacture of potassium humate from lignite

- **Vector Control Research Centre, Pudducherry**

- Mosquito larvicidal formulation of *Bacillus Thuringiensis Var. Israelensis*

- **Defence Research and Development Establishment, Gwalior**



- Test kit for microbiological quality of drinking water

Central Tasar Research & Training Institute, Ranchi

- Vijetha supplement powder (Silkworm Bed Disinfectant)
- Depuratex—a product and process for cleaning and surface sterilization of tasar silkworm, antherarea, mylitta

Central Silk Research & Training Institute, Mysore

- Navinya—a plant based formulation for control of mulberry root rot disease
- Poshan—a multi-nutrient formulation for correcting the nutrient deficiencies in mulberry
- Ankush (A New Silkworm Bed Disinfectant)
- Phyto ecdysone (Sampoorna)
- A machine for silkworm for harvesting silkworm cocoon from plastic collapsible mountages

Central Silk Research & Training Institute, Berhampore

- Sericillin—a synergistic composition for disinfecting silkworm body and silkworm bed

Indian Institute of Horticultural Research, Bengaluru

- A process for preparation of ARKA mango (*Mangifera Indica L.*) foliar spray formulation

Annamalai University, Annamalai Nagar

- Seaweeds extract fertilizer

CSIR-Central Mechanical Engineering Research Institute, Durgapur

- 20 HP Tractor

CSIR-National Physical Laboratory, New Delhi

- Indelible ink

Silkworm Seed Technology Laboratory, Bengaluru

- Resham Jyothi—a silkworm bed disinfectant

4. PROMOTIONAL ACTIVITIES

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

- Programme for Inspiring Inventors and Innovators (PIII)
- Programme for Development of Technologies for Commercialisation (PDTC)

A. PROGRAMME FOR INSPIRING INVENTORS AND INNOVATORS (PIII)

Prize Award for Meritorious Inventions

Innovation is the key driver to sustained industrial and economic growth and increasingly important for industries to compete in the domestic and global economy. Technological innovation and its proper diffusion are important factors to boost the competitiveness and growth of manufacturing sector and service industries.

The Corporation has been endeavouring to encourage innovative talent among the Indian citizens. The Corporation on behalf of DSIR under its Programme for Inspiring Inventors and Innovators gives Meritorious Invention Awards annually to Indian nationals working in India in Scientific and Industrial fields. The Corporation confer awards in three categories, viz. Innovation



Award (two of Rs 5 lakhs each), Societal Innovation Award (three of Rs 3 lakhs each) & Budding Innovators Award (five of Rs 1 lakh each). Each award carries a trophy, certificate and tax-free cash award. These tax-free awards are given with an objective to encourage inventive talent in the country and presented every year to the inventors and Innovators on the occasion of NRDC's annual event "Innovate India". This annual event of NRDC comprises of Meritorious Invention Awards Distribution Ceremony along with a brainstorming Conference on the theme selected from time to time.

Recognizing the importance of innovations in manufacturing sectors, NRDC has organized the conference and Meritorious Invention Awards function this year at Coimbatore in association with PSG College of Technology, Coimbatore on 25th and 26th February 2015. The conference theme was, "Make in India: Opportunities through Innovations".

The Innovate India 2015 event provided a strong platform to Industry, Academia, Innovators, R&D Organizations and Policy Makers together to discuss, share and learn about cutting edge manufacturing innovations and technologies that can help in enhancing productivity of the manufacturing sector of our Country, to improve quality and add growth at the bottom of pyramid.

The Conference was inaugurated by Dr. V.K. Saraswat, Hon'ble Member, NITI Ayog, Government of India, and attended by large number of young innovators, students, research scientists, industrial personnel and entrepreneurs. On this occasion, Dr. Saraswat presented five NRDC Meritorious Invention Awards of the year 2013 to twenty awardees. In the inaugural session Dr. S. Raghavan, Scientific Secretary, Office of the PSA, Govt. of India, launched a 'Technology Portal' developed by NRDC. This portal would be a platform for interaction of technology providers and technology seekers. NRDC conferred cash award of ~19 lakhs along with trophies and certificates to twenty awardees of the year 2013. A Panel

Discussion on "Make in India-Industry & R&D Perspective" was also organized during the event. During the Innovate India 2015 Conference a Business-to-Business (B2B) meeting was also held for showcasing technologies available with NRDC for commercialization and for attracting new technology sources. Several industries interacted with the NRDC officials for obtaining the licence for commercialization of technologies showcased. Various R&D organizations and individual innovators of the region expressed to collaborate with NRDC for commercialization of technologies developed by them.

Intellectual Property and Technology Facilitation Centres

The Micro, Small and Medium-sized Enterprises (MSMEs) are often the driving force behind such innovations. Their innovative and creative capacity, however, is not always fully exploited, as many MSMEs are not aware of how these emerging trends can help and safeguard them. To help MSMEs to fully utilize the emerging trends in their business activities, NRDC has established a facilitation center at Bangaluru with support of MoMSME. The objective of the Intellectual Property Facilitation Centre for MSME is to focus on protection and management of IP for the MSME by facilitating IP protection and innovation management in changing economic environment.

The centre is now functional at the campus of M.S. Ramaiah School of Advanced Studies located in Peenya Industrial Estate which is one of Asia's largest small-scale industrial hub.

The IPFC has been catering to the micro, small and medium enterprises in the region providing consultation and facilitation services for protection of their intellectual properties like patent, trademark, design registration, copyright and geographical indication. The industries in the region are being sensitised regarding their intellectual properties and protection of the same by way of organizing



awareness programmes, IPR workshops, participation in industrial meets, etc. The Centre has facilitated filing of eight patent applications, one Industrial Design, two Geographical Indications and two copyright application.

NRDC–University Innovation Facilitation Centres (NRDC-UIFC)

NRDC has been endeavouring to encourage innovative talent among the Indian citizens since its inception. To promote innovation related activities in the Universities, National Institute of Technology (NIT), IITs, Autonomous Institutions & Academic Institutions across the country. The Corporation has setup two NRDC Innovation Facilitation Centres (NRDC-IFC) during the financial year 2014-15 on behalf of DSIR under its Programme for Inspiring Inventors and Innovators (PIII). These Centres are located in the premises of the National Institute of Technology, Silchar, Assam and Indian Institute of Engineering Science & Technology, Shibpur, Howrah, West Bengal. NRDC has set up two centres in the previous year, one in All India Institute of Medical Sciences (AIIMS), Ansari Nagar, New Delhi and another at Amity University Uttar Pradesh (AUUP), Sector-125, Noida, Uttar Pradesh. In all, four NRDC-IFCs have been established in various R&D institutions and implementing the programme.

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These centres have organized Seminars and Workshops on Innovation, Intellectual Property Rights and Technology Transfer in these Institutions and sensitized more than 500 students, research scientists and faculty members about the effective management of Intellectual Property and technology transfer related issues to achieve the objectives of the NRDC-IFC Programme and helped them to file patents in India.

The NRDC–Innovation Facilitation Centres has also organized interactive sessions and in-house lectures for students, researchers and faculty-members on intellectual property protection and management, technology transfer and commercialization to encourage them, to create an appropriate environment in the Universities & Academic Institutions for the promotion of innovation processes and to stimulate the entrepreneurial activities within these institutions.

Intellectual Property Facilitation, Management and IPR Consultancy

One of the most prominent factors in the economic growth, socio-economic development is the creation of high value Intellectual Property. In a knowledge based economy, creation, acquisition, accumulation and application of Intellectual Property rights (IPR) are effective ways for industry to enhance growth and competitiveness. It has become necessary to protect our intellectual property in this competitive world. The Corporation continued to provide support to various Universities, R&D institutes and individual inventors etc. for filing patent applications in India and abroad during the year 2014-15. The various services provided and programmes undertaken are:

1. IP Protection:

During the year 2014-15, the Corporation in its pursuit to protection of inventions and technologies

developed by scientists, researchers and individual inventors has provided financial and technical assistance for filing of 35 patent applications received from various Universities, R&D institutes and individual inventors etc.

2. Patent Search Facility:

The Corporation has been catering to the requests received from various Universities, R&D institutes and individual inventors etc for conducting the state of the art searches, the results of which are utilized for submitting research projects at university level so that the invention related to the R&D project should be novel and not a mere repetition of the R&D work already done. During the year 2014-15, 55 Prior Art Searches have been conducted by the Corporation.

3. 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 18 awareness & training programmes on “Harnessing Intellectual Property and its Management for Growth and Prosperity” in collaboration with different R&D institutes/ universities. It has sensitized more than 1,500 participants. These programmes have been widely appreciated by all the segment of participants hailing from different sections of the society. NRDC officials have also delivered more than 52 lectures on different important issues of IPR and technology transfer.

4. Online Intellectual Property Rights and Knowledge Management Courseware for Certificate Programme [IPKMCP]

NRDC has envisaged a programme for Online IPR and Knowledge Management to create awareness on Intellectual Property and Innovation Management to grass root innovators/students/ professionals



through digital based medium. During the year, Corporation identified the resource persons for formulating and designing the courseware and interacted with other stakeholders for preparing action plan.

Knowledge Management Programme for Promotion of Innovation/Technologies

Knowledge Management Programme (KMP) is a self-propelled mechanism for systematic identification and evaluation of the technologies, by a team of experts for value addition to the extent possible for making a complete technology package for commercialization of technologies, so that the chances of success become high. Three Expert Panels in the areas of Biotechnology, Agriculture, Ayurveda & Herbal were formed. During 2014-15, 16 technologies related to Biotechnology, Agriculture, Ayurveda & Herbal were discussed in five meetings of expert panel. The Committee suggested various value additions required for the technology(ies) including market survey, test results, preparation of technology document/feasibility report of Detailed Project Reports etc. Technology evaluation carried out for some of the following technologies :

1. Anti hepatitis-C drug
2. Anti HIV drug
3. Curcumin encapsulated chitrasan alginate sponge

B. Programme for Development of Technologies for Commercialisation (PDTC)

The programme is planned to add value to the lab-scale technologies developed by the universities/research institutes/organization, dissemination of the information and promotion of entrepreneurship development and appropriate innovative technologies in rural and northeast regions. Under this scheme the Corporation carried out various

activities like Development of Innovation Portal, value addition through preparation of BEDP, Market Surveys, dissemination of information through exhibitions/seminars/workshops etc., promotion of indigenous technologies abroad through showcasing of indigenous technologies. The various activities undertaken in this scheme are :


Digital Knowledge Base

The systematic application of Science & Technology (S&T) is considered to be a very important tool in the social and economic development of any country and has played a major role in many of the developed as well as developing countries. A substantial investment has been put for building up the various infrastructure and research institutions for bringing out the various technologies that have widened the manufacturing base as well as enhanced the productivity. However, the information is not available at a single source in a structured manner. Internet, being a powerful medium for conducting business, it is very important that any entrepreneur or small scale industries should have access to all the latest developments that are taking place. NRDC being a premier Institute involved in technology transfer, desired to move in and fill up the gap by setting up a technology portal which shall provide complete information related to the technology required by the small & medium entrepreneur. Accordingly the information on technologies available for commercialisation was collected from various R&D institutes & universities across the country and the portal was successfully launched during Innovate India 2015 held at Coimbatore on 25 February 2015.

TECHNOLOGY VALUE ADDITION

Basic Engineering Design Package (BEDP)

The activity of developing a BEDP was initiated for value addition and making a complete technology package for the entrepreneur, so that setting up of the commercial plant becomes easier and its chances



of success become high. In order to take the process to a pilot scale or to a commercial level, 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. Based on BEDP, the entrepreneur can 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 developed :

1. Live attenuated salmonella vaccine
2. Topical nano-fibrous ocular patch
3. Anti hepatitis-C drug
4. Lactic acid production from renewable resources and formation of PLA scaffold
5. HIV drug

Market Survey

Market Surveys are of considerable significance to the process of technology transfer. It makes the technology package more attractive to entrepreneurs. During the year, market survey reports on the following, 20 technologies were conducted:

1. Topical nano-fibrous ocular patch
2. Topical formulation for rheumatic pain
3. Novel L-asparaginase for the treatment of acute lymphatic leukemia
4. Chicken anaemia test kit
5. Terbinafine HCl topical nano emulsion gel for treating fungal disease

6. Polyherbal formulation containing curcumin, quercetin and piperine
7. Rapid test for rabies virus
8. A seed coating composition and a process for its preparation
9. (a) Tsunami detection system &
(b) Tsunami test rig system and allied instruments (Oceanographic Instruments)
10. Photoactive scratch resistant titanium oxide coating on glass
11. Ceramic coating for photocatalysis & self-cleaning Glass
12. Sensing mass at micro-scale—a novel approach to controlled delivery
13. Anti hepatitis-C drug
14. An efficient and affordable epidemiological sensor for hemoglobin
15. Azzola based animal feed pellets
16. Stain free detection of thalassemia carrier
17. HIV drug
18. Systems and methods for drug delivery—smart and targeted release of drugs by platelets
19. Platelet mediated cell seeding
20. Live attenuated salmonella vaccine

Promotion of Innovation in Rural and North-Eastern States

The Corporation with an objective to create employment opportunities and capacity building of development agencies for skill upgradation through

the application of innovative technologies in rural and backward areas carried out the following activities during 2014-15:

1. EDP on “Dissemination of green technologies; biopesticides, cattle feed, fodder management and rapid composting” implemented in association with IIT, Delhi. EDP was conducted at Krishi Vigyan Kendra Sikkohapur, Gurgaon and 80 farmers participated in this programme.
2. EDP on “NPK Rich Bio-manure” implemented in association with Vivekanand Kendra, Kanyakumari. EDP was conducted at Kanyakumari, Tamil Nadu in three batches and about 157 candidates were benefited during this programme.
3. EDP on “Design & Fabrication of Electronic Charger for Mobile and Emergency Light” implemented in association with Society for Pollution & Environmental Conservation Scientists (SPECS), Dehradun-248001. EDP was conducted at Mori Block (Utarkashi), Uttarakhand and about 31 participants were benefited during this programme.
4. EDP on “Organising Training of low-cost sanitation” implemented in association with Centre for Industrial and Management Consultants (CIMCO), Kanpur, UP. EDP was conducted at Hari Singh Dev Ka Purwa, Kalyanpur Tehsil, Kanpur Nagar Dist, UP and about 31 candidates were benefited during this programme.
5. EDP on “Developing Entrepreneurship for Silk Cocoon Harvesting” implemented in association with Central Silk Research & Training Institute (CSR&TI), Mysore. EDP was conducted at Mysore, Karnataka and about 50 candidates were benefited during this programme.
6. EDP on “Training, Capacity building and implementation of Queen Kiln (CSIR-IIMT

technology) for improvement in terracotta product for artisans/SHG group” implemented in association with SHRISTI, New Delhi. EDP was conducted at Mandla, Jabalpur, Madhya Pradesh and about 100 candidates were benefited during this programme.

Socio Economic Development of North-East

The corporation has taken up two projects in North-eastern regions for creating employment opportunities through implementing projects like extending the shelf life of perishable fruits and vegetables and undertake organic fruit Cultivation & Processing Programme at Mizoram.


a) Enhancing shelf life of fruits and vegetables through innovative technological intervention

During the year Fru Washing Machine alongwith coating material was sent to CSIR-CMERI, CDAR Turial Airfield, Aizawl for carrying out demonstration and coating of fruits and vegetables available in the region. Training programme was conducted at the Centre. The centre is running and giving training to fruit vendors, farmers, etc. The centre is handed over to CDAR.

b) Certified Organic Fruit Cultivation & Processing Programme at Mizoram



Field Visit at Ngopa village, Mizoram



The Corporation has undertaken project on “Certified Organic fruit cultivation and processing programmes at Mizoram” with an objective to facilitate the utilization of abundantly available natural resources of Mizoram for the betterment of the local community and promote organic farming and post harvest processes.

During the year 25,500 lemon planting material was distributed and EDP was organised for 262 farmers of Ngopa and Lamzawl village of Champhai district of Mizoram wherein techniques and technologies that can be adopted for carrying out organic farming were demonstrated.

Exhibitions and Publicity

Participation in exhibitions, seminars, workshops are of vital importance for creating awareness regarding the activities of the Corporation and technologies available with the Corporation for transfer. With this objective in view, the Corporation participated in 38 exhibitions and disseminated information on 50 technologies for licensing of technologies in India and abroad organized by various agencies.

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 amongst the students, scientists, technicians, budding entrepreneurs, etc.

During the year special issues were brought out on Fusion Plasma Technology, Indian Space Programme on the occasion of successful insertion of India’s Mangalyan into the Mars orbit and Swatch Bharat abhiyan.

Awishkar aur Navachar (Invention & Innovation), NRDC kee Prodiykee apkey liyae (NRDC

Technologies for You) and Bhaudhkik Sampda kee batain (Talks of Intellectual Property) were published as regular columns in the magazine.

List of Publications 2013-14

- Prize Award (Folder) : Make In India– Opportunities through Innovation
- Citation : NRDC Meritorious Invention Awards (2013)
- NRDC Brochure : NRDC–Your Technology Partner Technology and Project Export

TECHNOLOGY AND PROJECT EXPORT

Pilot Research Project for Tomato Production in Ghana

The Corporation in its efforts for transfer of technology to the developing countries mainly in Africa, has undertaken a project for setting up a “Pilot Research Project for Tomato Production in Ghana” with a financial support from MEA, Govt. of India.

The objective of the project is to conduct the problem oriented applied research in 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 will be carried out at three locations in Ghana. The three sites for the implementation has been allocated through CSIR, Ghana, Ministry of Science, Technology and Environment, Govt. of Ghana. The Corporation has already undertaken the procurement of agriculture implements, machinery, tractors, trolleys, etc.

5. Human Resource Development

The thrust for better utilisation of Human Resource and improvement in work practice continued during 2014-15. Training and development at all levels of



employees was given due priority by the Corporation to increase effectiveness. Special emphasis was given to organisation building and shaping right attitudes, team building and work culture, besides preparing employees to understand the trends in fast changing technology and switching over to latest technology for achieving higher results in productivity and profitability.

The real asset of any company is its human resource. The total manpower of the Corporation as on 31st March 2015 is 85, viz., (Group A-32, Group B-21, Group C-21, Group D-6, and Group D (contractual)-5. The employee-management relationship was cordial throughout the year. In addition to the above manpower, the Corporation has also engaged three engineers on contractual basis.

6. Technology Absorption, Adaptation and Innovation

While a major objective of the corporation is the development and commercialisation of indigenous technology, 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. Hence the requirement to furnish information in respect

of Technology Absorption, Adaptation and Innovation under Rule 2(B) of Companies (Disclosure of Particulars in the Report of Board of Directors) Rules, 1988, is not applicable to the Corporation.

7. 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 increasing the use of Hindi Rajbhasha in office during the year 2014-15. 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 enrich Hindi vocabulary of the employees of the Corporation as well as visitors, an English word with its Hindi meaning is written daily on a writing board as 'Today's word' at the reception of the Corporation.