Performance Targets Achieved in 2024 - 2025

	Objectives	Planned	Achieved
1.	**Total External Cash Flow (ECF)**	**30.0 Crores**	**2013.08364 Lakhs**
2.	**Industrial ECF (a part of ECF)^**	**16.0 Crores**	**1461.96334 Lakhs**
3.	**Customer Satisfaction Index**	**4.8 (Max 5)**	**4.8**
4.	**SCI Publications**	**140**	**159**
5.	**Non-SCI Publication**	**-**	**25**
6.	**Patents Filed** **Industrial Designs**	**10**	**6** **1**
7.	**Copyrights**	**5**	**1**
8.	**Technologies Developed***	**5**	**5**
	Technologies Transferred#	**5**	**5**

^Cash flow generated from sponsored projects of industrial, PSU and government agencies.

***Technologies Developed:**

1. *Magnetoimpedance (MI) based array sensing device for detection of carburisation and defective welds: MagRays (Technology Readiness Level- 7)*
2. *An improved hot dip coating process (Technology Readiness Level- 6)*
3. *Colorized galvanizing coated steel products and their process (Technology Readiness Level- 6)*
4. *Recovery of Zinc as the valuable product (Zinc sulfate monohydrate/zinc carbonate/zinc/metal) from lean grade zinc dross (Technology Readiness Level- 9)*
5. *Cost-effective hot-rolled steel with ultrahigh strength and excellent toughness (Technology Readiness Level- 5)*

#Technologies Transferred:

1. *Know-how for the development of Ti3AlC2 MAX phase ; Licensed to M/s. Global Nanotech, Goregaon*
2. *Know-how for the development of Magneto impedance-based array sensing device for detection of carburization and defective welds- MagRays; Licensed to M/s. Accelor Microsystems, Chandigarh*
3. *Process flow-sheet for production of self-healing coating and primer suitable for application on rusted steel; Licensed to M/s. Asianol, Kolkata*
4. *A pyro-hydrometallurgical process for holistic recycling of variable zinc dross, high and low grade, to recover zinc metal and its salts; Licensed to M/s. Chandigarh Technologies, Haryana*
5. *Know-How to recover saleable products of Cu, Al, and Au as Metals/ salts from waste PCBs, Licensed to M/s. Eyantram Waste Management Private Limited, Bangalore*

Major Technological & Scientific Targets Planned and Achieved in 2024-2025

Planned for 2024-2025	Achieved in 2024-2025
Applied & Analytical Chemistry	
1. Coking coal assessment through Artificial Intelligence	1. The respective project has been approved by Coal India Ltd, and the project work is in progress.
2. Direct regeneration of spent LIBs cathode material and reuse in energy storage device	2. The development of the process is almost complete. One SCI publication in progress.
3. Coal characterization and analysis	3. A large number of Coal sample characterizations and analyses have been done for various industries and subsidiaries of Coal India Ltd. In the past fiscal and, the activity is ongoing.
4. Ceramic primer for rusted steel.	4. Technology has been developed and transferred to M/s. Asianol BioTech, Kolkata.
5. Development of different grades of coal CRMs of Indian coals.	5. Three Grades (G10, G13 & Steel Grades) of Coal CRMs (In a lot of approx. 700 bottles of 50 gm pack size of each CRM) have been developed based on the Indian coal base.
6. Development of eight grades of Indigenous iron ore CRMs from 40% Fe to 67% Fe for XRF analysis.	6. The development of eight grades of Indigenous Iron Ore CRMs from 40% Fe to 67% Fe for XRF analysis has almost been completed. In progress.
7. Development of different grades of Bauxite and Dolomite CRMs.	7. Half of the development work has been completed, related to the CRMs for Bauxite & Dolomite. In progress.
8. Development of 6063 grade Al disc standard (500Nos.)	8. Most of the work has been completed, related to the development of the 6063 grade Al disc standard (500 Nos.). In progress.
9. Development of two different grade Pb base disc CRMs (500Nos. of each grade).	9. Half of the work has been completed, related to the development of two different grades of Pb base disc CRMs (500 Nos. of each grade). In progress.
10. Development of four different grade Chromite ore CRMs (200Nos. of each grade).	10. Four CRMs 181, 182, 183 & 184 (In a lot of 200 bottles of 100gm pack of each CRM) have been prepared.
11. Development of an alternate reagent for the elimination of mercury effect for reliable analysis of Hg in coal and coal fly ash samples.	11. The undesirable “Memory effect” for the analysis of Hg in the ICP system can be eliminated by the addition of Au in the rinsing solution. However, the application of gold is expensive and not practically feasible for commercial laboratories. In the current study,

	we have successfully evaluated and proposed L-cysteine as a low-cost additive reagent to minimize the memory effect, without compromising the desirable analytical characteristics for the analysis of Hg in coal samples.
Materials Evaluation	
• Powder production for additive manufacturing: Steels and Amorphous alloys • Scaling up of armour steel to achieve (TRL-7)	• Achieved • In progress
Metals Extraction & Recycling	
1. Pidgeon process for the production of magnesium metal. 2. Critical metals from the primary and secondary resources under Mapping & Tapping of Critical Minerals mission of CSIR 3. Development of self-healing geopolymer under CSIR first scheme **4.** Development of technology for Extraction of zinc metal and salts from zinc dross.	1. Production from prototype equipment has been done at 2kg/ batch scale. 2. Three projects were started under this mission of the CSIR. Currently, initial studies are ongoing. 3. One project on self-healing geopolymer was sanctioned under the CSIR First scheme and is ongoing. 4. Technology developed and transferred to M/s Chandigarh Chemicals.
Mineral Processing	
1. Development of process for beneficiation of lean grade iron ore having less than 45% Fe content 2. Recovery of lithium concentrate & other critical minerals from Lithium ore of Jharkhand 3. Bench Scale Beneficiation and Pelletization Studies of Iron Ore Samples from ISMQ, Egypt. 4. Extraction of vanadium as high pure V_2O_5 and TiO_2 from Vanadium titaniferrous magnetite ore 5. Beneficiation and palletisation on tailing from Kiriburu mines, Meghatuburu mines and composite sample of both tailings	1. Achieved as per plan (Ministry of Steel granted the project) 2. In Progress. Discussions are ongoing. 3. In Progress. Discussions are ongoing. 4. The proposal was submitted to the CSIR Critical Mineral Mission but could not be approved 5. Participated in the tender, but the tender was cancelled by SAIL
Advanced Materials & Corrosion	
1. Commercialization of Billet Mould Break-out detection Technology**.** 2. Implementation of LTCC based eddy current sensor for real time creep	1. Transferred to Industry. 2. In progress

damage monitoring in one of the power plant components. 3. Implementation of AI based technology for thermal mapping of downcomer of pellet plant in a steel plant. 4. Performance evaluation of Ultrasonic Flowmeter in the space environment. 5. Establishment of Ultrasonic imaging technique to assess the quality of connecting rods of Tata Cummins. 6. Design, fabrication and transfer of Binder Gauge device. 7. Set up development for 3.5 cm X 3.5 cm and 5 cm X 5 cm AEM alkaline electrolyser cell for green hydrogen 8. Development of biodegradable Zn-alloys for implant applications 9. Development of multilayer Zn coated high strength Mg-based biodegradable alloys 10. Design and development of Iron amorphous alloy powders for thermal spray coatings. 11. Fe-Nitride powders for hard magnets through Ammonia gas nitriding route. 12. Application of GMI based sensor "MagRays" in structural integrity assessment of components in cement industry 13. Development of working prototype of Planar flow Castor (5kg) for producing thin metallic strips. 14. Development of ferrochrome slag coating for continuous steel caster rolls 15. Development of antimony chalcogenide-based photo absorber coatings for photovoltaic applications	3. Project is completed and deliverables are achieved 4. In progress 5. Project is completed and deliverables are achieved 6. Project is completed and deliverables are achieved 7. Developed 3cm X 3cm cm AEM alkaline electrolyser sell for green hydrogen. 8. Biodegradable Zn alloys developed 9. Multilayer Zn coated high strength Mg-based biodegradable alloys developed 10. In Progress 11. In Progress 12. Technology on GMI based sensor "MagRays" developed and transferred to Accelor Microsystems, Mohali, Punjab 13. Working prototype of planar flow Castor (5kg) is developed 14. Project is completed and deliverables are achieved 15. Project is completed and deliverables are achieved

16. Development of Zn-Al-Mg based hot dip coating for cold rolled steel sheet (RDCSI)	16. An MoU has been signed between RDCSI-NML. Experimental work will start after a one-time service of HDPS.
17. Development of Fe-based amorphous alloy and its coating by HVOF for hydro turbine components	17. Fe-based amorphous alloy powder preparation through gas atomizer is In process
18. An energy-efficient phase specific process for ZnFe-alloy electroplated high strength steel for automotive application	18. Project is completed and deliverables are achieved. Findings are submitted for the CSIR-URDIP report
19. Electrodeposited corrosion-resistant carbide coatings on SS 316L for Sink Roll applications in Continuous Galvanizing Lines	19. Patent File: CSIR No: 0257NF2024. Achieved TRL-6. The industry partner will provide a CGL sink roll to attempt a technology demonstration at Ahmedabad Plant.
20. Advanced Colorized Hot Dip Galvanising Zn-X (X- Mn, Ti, Co) Alloy Coating with Excellent Powdering and Corrosion Resistant	20. Project work is in progress. Uniform color coating is achieved on the large-sized steel sheet (22 cm X 11 cm). A technology demonstration will be carried out in wire galvanizing plant.
21. CEMILAC certification for Binary Zn-Mn Alloy Coatings to Replace Toxic Cd Coated High Strength Steel Aerospace Components	21. The CEMILAC certification process is currently in progress for binary Zn-Mn alloy coatings.