

Minutes of 23rd Project Evaluation & Review Committee (PERC) meeting held under the chairpersonship of Mrs. Farida M Naik, Joint Secretary, Ministry of Mines on 11th December 2023 at JNARDDC, Nagpur.

1. 23rd meeting of the Project Evaluation and Review Committee (PERC) was held under the chairpersonship of Mrs. Farida M. Naik, Joint Secretary, Ministry of Mines on 11th December, 2023 at JNARDDC, Nagpur to consider the project proposals received through SATYABHAMA Portal. **The list of participants is enclosed in Annexure-A.**

2. At the outset, the Chairperson welcomed the participants and on behalf of Ministry of Mines and PERC offered condolences to Late Shri T. C. Rao who was a member of the PERC. A two-minute silence was also observed by the members before start of the Meeting. Thereafter, the Member Secretary, PERC made a presentation on the projects received on SATYABHAMA Portal. He informed the PERC that Ministry of Mines made an announcement on 04.11.2023 inviting Project Proposals from Academic Institutions, Universities, National Institutes and R&D Institutions recognized by the Department of Scientific and Industrial Research, Government of India for up to 3 years duration on the topics of directed R&D and in the thrust areas which have direct bearing on mineral sector, applied and sustainable aspect of mining and industrial applications. The last date of submission of projects was 04.12.2023 and a total of 82 Project Proposals were received.

3. Member Secretary also intimated that 82 project proposals have been preliminary scrutinized by a team of experts of the Ministry in terms of the S&T Guidelines particularly with reference to mandatory requirement of the S&T Guidelines. Out of the 82 project proposals, 45 project proposals were found to meet the conditions as stipulated in the guidelines and hence were placed before the PERC. These 45 proposals covering three major groups (i) Metallurgy :- (Alloys, Rare Earths, Specialty materials and product ; Metal Extraction (Metallurgical processes); Circular Economy and Recycling of Non ferrous metals) (ii) Mining :- (Mining includes rock mechanics, design, equipments, energy, environment, safety; Geoscience and Exploration; and Decarbonisation : Green Technology in Mineral based industry) (iii) Mineral Processing :- (Beneficiation, Ore Dressing, Mineral Processing & Recovery from waste; Extraction of strategic, critical minerals and REE) were considered by the PERC. The proposals categorised in three major groups were evaluated by three groups consisting of members of the PERC in three separate meeting rooms at JNARDDC. The members and PIs attended the meeting including a few PIs who presented through VC. As per the terms of reference of PERC, the concerned members recused themselves, to avoid conflict of interest, from the proceedings from that part of the meeting when project(s) related to their institute(s) was under consideration.

4. At the outset of the three groups meeting, the members were briefed about the following criteria for detailed evaluation of the project proposals of their respective group:-

(i) Does the proposal cover the thrust areas ?

- (ii) Is industry / CSIR funding available for the project ?
- (iii) Is the problem well defined?
- (iv) Does the proposal adequately cover prior work both in the institution and elsewhere? Is it similar to any earlier work already sanctioned; has the PI done prior work to prove proof of concept before submitting the project or is the project in the early stage itself?
- (v) Does it address a critical gap in our country's needs and requirements?
- (vi) Is the methodology of work well laid out and doable?
- (vii) Are the deliverables well defined?
- (viii) Is there a translational potential for application / user interface? Can it move to higher TRL?
- (ix) Does the PI and institution have adequate competence to do the proposed research?
- (x) Is there collaboration with another Lab or institution or industry to enhance the quality and quantum and application potential?
- (xi) Budget: Is the budget correctly done? Is there deficiency or excess?
- (xii) Time duration?
- (xiii) Any other comments.

5. After the detailed evaluation of all the projects, the 3 panels met together and recommended 10 projects for consideration of the SSAG in its next meeting. In respect of 5 projects, the PERC made conditional recommendations. Remaining projects were not found fit for recommending to SSAG. The detailed recommendations of the PERC in respect of these 45 projects are given below:

1.	
Project No.	SNTMOM/952/2023
Project Title	Recovery of Molybdenum, Nickel and Alumina values from spent hydrotreating catalyst of HPCL and Demonstration at Pilot plant (TRL-7) and techno-economic feasibility studies.
Institution	Non Ferrous Materials Technology Development Centre
Principal Investigator	D Lokeswara Rao (9849604852 lokesh@nftdc.res.in)
Project Cost & Duration	Rs.82,16,500 .00 (Rs.33,16,500.00 (MoM) + Rs.49,00,000.00 Industry Partner) 1 Year
Industry Partner /Contribution	Hindustan Petroleum Corporation Ltd Rs.49,00,000.00
Objectives of the project	Approximately 220 Tons (110 Tons – CoMo/Al ₂ O ₃ , 110 Ton-NiMo/Al ₂ O ₃)/ year from HPCL Mumbai refinery and 230 tons (110tons- CoMo/Al ₂ O ₃ , 120 tons – NiMo/Al ₂ O ₃) /year spent hydro treating catalyst wastes are generated. The typical Mo and Ni content of the spent hydro treating catalyst after use in the

	refining by HPCL contains 5-15% Mo and 1-5% Ni on Al ₂ O ₃ substrate. This spent catalyst was taken for prior work. The objectives are: 1. Development of process flow sheet for recovery of Molybdenum, Nickel/ Cobalt and pure alumina from the spent HDS catalyst. 2. Process intensification techniques of Microwave and sonication to be incorporated in the leaching circuit. 3. Development of a closed loop, zero discharge process without effluent. 4. Achievement of 90% leaching efficiencies with an overall 80% material recovery. 5. Pilot plant at 25 kg level (TRL-7) for demonstration up to 1-ton operations. (Six months) 6. Techno-economic study at DPR for 400 TPY spent catalyst plant (yielding approx. 40 TPY Mo values and 10 TPY of Ni values and 300 TPY of alumina values at HPCL-NFTDC site.
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. Project idea is good. 2. Ultra sonification is commercially viable as it is used as an assist and as loop-in circuit of the conventional leaching system. 3. Project is TRL-7. 4. Project covers processing spent catalyst as demonstration of 1ton/day equivalent in the pilot plant as 25 kg batch size. 5. Spent Catalyst materials of 2 tons already received from HPCL for the project. 	
RECOMMENDED	

2.	
Project No.	SNTMOM/954/2023
Project Title	Development of Next Generation Abrasion Resistant Alloys for Mining Applications
Institution	Indian Institute of Technology ISM Dhanbad
Principal Investigator	Avanish Kumar (9853771070 avanish@iitism.ac.in)
Project Cost & Duration	Rs. 59,33,084.00 (Rs.47,33,084.00 (MoM) + Rs.12,00,000.00 Industry Partner) 3 Years
Industry Partner /Contribution	BRADKEN Rs.12,00,000.00
Objectives of the project	The current research proposal outlines a three-year project plan formulated to fulfill the following major objectives: <ul style="list-style-type: none"> • To develop new high strength, high hardenability steels with increased impact and wear resistance for mining machinery components using thermodynamic alloy development approach. • To understand and minimize the metallurgical issues like shrinkage cavities, segregation and hydrogen cracking to meet the mechanical design requirements for thicker gauge applications. • To understand the role of alloying

	elements during the design and optimization of the heat treatment cycle to ensure through-the-thickness microstructural homogeneity with concomitant achievement of the target strength-ductility balance. • To develop a comprehensive database through systematic literature review on chemical composition, heat-treatment parameters, microstructure, mechanical properties and wear characteristics of existing mining grade steels. This will help in developing clear strategies for design and development for new steels
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. Benchmarking is required for project 2. It is not TRL-3 level, it is a lab scale level project 3. Experiment should be done with product thickness 4. PI needs to find one more industry partner to reduce CAPEX. 	
NOT RECOMMENDED	

3.	
Project No.	SNTMOM/956/2023
Project Title	Potash recovery from Nepheline Syenite- Process scale up and validation at Bench scale
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	Barsha Dash (9439018460 barsha.dash@gmail.com)
Project Cost & Duration	Rs. 32,35,000.00 (Rs.24,26,250.00 (MoM) + Rs.8,08,750.00 Industry Partner) 2 Years,
Industry Partner /Contribution	Rs. 8,08,750.00
Objectives of the project	Extraction of potash from Nepheline Syenite: Bench scale testing and process validation.
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. PI has not identified the supply source / mine regarding input raw material 2. Work is still in TRL-2 level and bench scale testing should be done prior to the proposal. 3. No continuous supply source regarding project identified 4. PI advised to look for potential resource sites for potash across India as well as contact relevant state government departments and state mining corporations, complete significant prior work. 5. Industry partner contribution can be higher. 	
NOT RECOMMENDED	

4.	
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Project No.	SNTMOM/957/2023
Project Title	Development of metal scrap sorting technology based on colour and shape-based which utilises advanced imaging and computer vision techniques to identify and classify metal scraps
Institution	VELLORE INSTITUTE OF TECHNOLOGY
Principal Investigator	Kathirvelan J (9500356597 j.kathirvelan@vit.ac.in)
Project Cost & Duration	Rs. 30,29,238.00 (Rs.28,29,238.00 (MoM) + Rs.2,00,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs. 2,00,000.00
Objectives of the project	The specific objectives of the project are to: 1. Develop image acquisition and processing techniques for capturing high-resolution images of the metal scraps in real time. 2. Design and implement machine learning algorithms in the computers for classifying metal scraps based on colour and shape of the metal plates as part of computer vision technology. 3. Integrate the developed computer vision system into a real-time sorting process for separating metal scraps in mining operations.
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. Project is of TRL- 2 2. This type of work is already done (DK Aluminium) 3. PI advised to collaborate with JNARDDC who have already submitted a similar proposal and then jointly come up with a revised proposal. 	
NOT RECOMMENDED	

5.	
Project No.	SNTMOM/958/2023
Project Title	Development of Eco-friendly molten salt extraction process for Nd and Pr and Establishment of 25-50 TPY Nd and Pr Metal Extraction Demonstration Plant (TRL7-8) for Rare Earth Magnet Production
Institution	Non Ferrous Materials Technology Development Centre
Principal Investigator	Nirmal Panda (9985509736 nirmalpanda@nftdc.res.in)
Project Cost & Duration	Rs.15,98,19,000.00 (Rs.2,95,35,000.00 (MoM) + Rs.13,02,84,000.00 Industry Partner) 2 Years,

Industry /Contribution	Partner	Midwest Rare Earth Rs. 13,02,84,000.00
Objectives of the project	WP-1: Design and fabrication of 25-50TPY demonstration Nd/Pr Extraction Plant of 8KA Molten Salt Electrolytic Cell WP-2: Innovative process development in terms of eco-friendliness using coated carbon or non-carbon electrodes. WP-3: Nd/(Nd-Pr) FeB alloy powder using rapid solidification process and process equipment development WP-4: Establishment of demonstration plant: 25-50 TPY entry level plants (TRL 7/8) and demonstration up to 6 tons of metal production.	
REMARKS/SUGGESTION:		
<ol style="list-style-type: none"> 1. Project idea is good and it fills the important gap of oxide to metal extraction in RE magnet production 2. Product and technology are needed for both strategic applications as well as e-mobility mission 3. Project covers material + process + product development + demonstration at pilot plant scale and equipments are developed and system integrated in this project. 4. Extensive prior work done over many years; Final product, namely RE magnet for motor is validated and commercially used in e-vehicles. 5. Transfer of technology to the industries will be available at a more matured level (TRL-7) on non-exclusive basis which is ultimate the aim of proposal. 6. Pilot plant sizing is at 10 kg per hour (max) and operations at 3.5 -8KA cell is equivalent to 2 tons per month or 24TPY and hence demonstration sizing is appropriate. 7. Raw material oxide for the entire project already tied up with IREL. In addition, NFTDC itself is gearing up to production of oxides from RE concentrates in another project. 8. OPEX cost is higher than CAPEX (80/20) for RE metal extraction and hence MoM funding is predominantly for capex at 15-20% 9. High OPEX budget for trial for 6 tons over 1-12 months and has been picked up the industry partner so as to facilitate validation of the process and maturing the technology development at higher TRL. 		
RECOMMENDED		

6.	
Project No.	SNTMOM/962/2023
Project Title	Designing Manufacturing and Developing SoP for Electromagnetic Force Convection (EM FC) Technology to Achieve a Uniform Composition in Aluminium Alloy Castings
Institution	National Institute of Technology Raipur, National Institute of Technology Rourkela
Principal Investigator	Sanjeev Das (07005707288 sdas.mme@nitrr.ac.in)
Project Cost & Duration	Rs. 53,75,688.00 (Rs.45,69,335.00 (MoM) + Rs.8,06,353.20 Industry Partner

		3 Years,
Industry /Contribution	Partner	M/s Vedanta Ltd. Jharsuguda Rs. 8,06,353.20
Objectives of the project		1) To design and develop an indigenous industrial scale EM-FC DC caster for casting aluminum alloy, i.e., 7xxx and 5xxx series. 2) To optimize the various process parameters and cast aluminium alloys as per requirement from Vedanta Limited Jharsuguda. 3) To analyse and characterize the macro/microstructures, defects, and chemical composition from various parts of the cast billet. 4) To develop a SoP for Vedanta Limited Jharsuguda for casting aluminium alloy billet with uniform composition.
REMARKS/SUGGESTION:		
<ol style="list-style-type: none"> 1. PI needs to undertake preliminary work relating to hydraulic studies, frequency generation for extrusion of billets etc 2. PI should preferably have tie up with the DC casting manufactures 3. Project is below TRL-3. 		
NOT RECOMMENDED		

7.		
Project No.		SNTMOM/964/2023
Project Title		Development of purification process technology for the preparation of ultra-high purity - 7N aluminium for epitaxial electronic and other speciality applications
Institution		Hindustan Institute of Technology and Science
Principal Investigator		V N Mani (7382489862 vnmani@hindustanuniv.ac.in)
Project Cost & Duration		Rs. 56,53,350.00 (Rs. 45,23,350.00 (MoM) + Rs.11,30,000.00 Industry Partner) 3 Years,
Industry /Contribution	Partner	Rs.11,30,000.00
Objectives of the project		1. Development of an indigenous modular system with directional zone-melting-solidification capabilities that tilt both vertically and horizontally. 2.Purification process technology package development for the preparation of 7N (99.99999) purity level poly-crystalline type aluminium. 3. Employing a combination of both horizontal and vertical directional zone-melting and solidification, levelling processes and crucible/boat containing 4N/5N purity level starting aluminium metal aided with vacuum/inert gas ambient(s) and application of an external electro-magnetic field to the molten zone/melt interface region and purifying aluminium metal to 7N purity level at 500 grams batch level. 4. Purity analysis, XRD characterisation and clean-

	<p>packaging. Originality-New Concepts for Process Innovation and Equipment Development: a) The development of purification systems and the use of a mix of zone-melting and solidification processes that are oriented both horizontally and vertically, driven by fractional crystallization and refining, to achieve ultrahigh purification concepts and methods. b) Applying an external electromagnetic field to the melt interface of aluminum in both vertical and horizontal directions to facilitate zone-melting and leveling solidification processes. c) Modelling of the aluminium ultra-high purification process using and aided by advanced process modelling software and AI tools.</p>
<p>REMARKS/SUGGESTION:</p> <ol style="list-style-type: none"> 1. Project deliverables in terms of apparatus for zone refining of Al and 7N purity product requires extensive prior work specific to aluminium refining. 2. Refining to Ultra purity as the first stage from 99.9 to 99.99+ becomes the feed material for zone refining. It cannot be sourced, but had to be developed a priori before embarking on 7N purity. 3. A few impurities cannot be removed by zone refining as well. 4. Analysis is difficult in this project 5. PI should first attempt to do 4N and 5N purity from commercial grade aluminium as a priori work. 	
<p>NOT RECOMMENDED</p>	

8.	
Project No.	SNTMOM/965/2023
Project Title	Development of Technology for Anodizing of High Silicon Aluminium Alloy Castings Manufactured through Direct Metal Laser Sintering Process
Institution	SNR SONS CHARITABLE TRUST
Principal Investigator	<p>P.Chandramohan</p> <p>(9486771077 chandramohan@srec.ac.in) Thro - VC</p>
Project Cost & Duration	<p>Rs. 6,08,50,600.00 (Rs.4,86,80,600.00 (MoM) + Rs.1,21,70,000.00 Industry Partner)</p> <p>3 Years,</p>
Industry Partner /Contribution	Rs.1,21,70,000.00
Objectives of the project	<p>To evaluate diverse Direct Metal Laser Sintering (DMLS) conditions to determine optimal settings for manufacturing AlSi7Mg0.6 and AlSi10Mg alloy. To investigate on solutionizing and stress relieving at varying temperatures to achieve desired silicon distribution in additive manufactured</p>

	<p>AlSi7Mg0.6 and AlSi10Mg parts. To explore diverse anodizing conditions (voltage, electrolyte concentration) aiming to prevent the formation of black skin on AlSi7Mg0.6 and AlSi10Mg parts. To analyze and compare the microstructural features of as-built, heat treated, stress relieved, and anodized AlSi7Mg0.6 and AlSi10Mg parts to understand changes brought about by each stage. To investigate the texture studies and bonding performance of AlSi7Mg0.6 and AlSi10Mg parts through various manufacturing and treatment stages. To conduct comprehensive potentiodynamic polarization experiments to assess the corrosion performance of as-built, heat treated, stress relieved, and anodized AlSi7Mg0.6 and AlSi10Mg parts. To utilize Scanning Electron Microscopy to examine failure mechanisms in the parts, correlating these findings with the obtained corrosion performance and the specific microstructural features derived from varied anodizing processes, heat treatment, and 3D printing parameters.</p>
<p>REMARKS/SUGGESTION:</p> <ul style="list-style-type: none"> • CAPEX is around 90% of the total project cost. • Products are not specified • The proposal lacks novelty and proof of concept is missing. • It's more of a capital building exercise. 	
<p>NOT RECOMMENDED</p>	

9.	
Project No.	SNTMOM/969/2023
Project Title	Design and development of a zinc extraction model from lignite and other sources of fly ash produced by nlc india limited and other incineration unit
Institution	Annamalai University
Principal Investigator	<p>P. PREMKUMAR</p> <p>(9894977835 ppklmeau@gmail.com)</p>
Project Cost & Duration	<p>Rs.4161000.00 (Rs.36,98,700.00 (MoM) + Rs.4,62,300.00 Industry Partner)</p> <p>3 Years, 1 Month</p>
Industry Partner /Contribution	<p>NLC India Limited</p> <p>Rs.4,62,300.00</p>
Objectives of the project	<p>The objective of project are given below 1. Recovery of zinc from various sources of fly ash 2. Removing of toxic elements like cadmium and lead from fly ash. 3. Increasing the efficiency of zinc recovery by changing the various conditions like temperature, pH, stirring time, acid contraction, and other characteristics. 4. Removal of impurities from fly ash before it discarded</p>
REMARKS/SUGGESTION:	

1. Project lacks proof of concept
2. Preliminary studies on fly ash composition not done.

NOT RECOMMENDED

10.	
Project No.	SNTMOM/971/2023
Project Title	A sustainable method of developing recycled Nitinol shape memory alloy components employing cryogenic milling, sintering and additive manufacturing process
Institution	National Institute of Technology Silchar
Principal Investigator	SIMANCHAL KAR (Thro – VC) (08249994335 simanchal@mech.nits.ac.in)
Project Cost & Duration	Rs. 23,93,500 (Rs.23,43,500 (MoM) + Rs.50,000 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.50,000.00
Objectives of the project	The following objectives are presented to realize sustainable manufacturing of NITINOL products: 1. To achieve requisite pulverisation of metallic chips of Nickel 400 alloy and pure Titanium scrap to obtain micro and nano-size particles using an indigenously developed cryogenic ball mill. 2. To attain near equiatomic homogenous composition of Nitinol powder with uniform martensite phase. 3. To successfully sinter nitinol structure and obtain desirable properties. 4. To achieve homogeneous extrusion of nitinol wire for additive manufacturing. 5. To additively manufacture nitinol specimens with desired mechanical properties.
REMARKS/SUGGESTION:	
<ul style="list-style-type: none"> • The project proposal lacks clarity, proof of concept is missing. • No prior experiment performed • Project proposal is below TRL 3 • The cash funding by industry is minimal and far below 20% (Rs 50000 only) • Additive Manufacturing Job work companies already offer this for dental restorations. 	
NOT RECOMMENDED	

11.	
Project No.	SNTMOM/976/2023
Project Title	Visible and Thermal Camera Integrated with Deep-Learning Scheme for Automatic Metal Scrap Sorting Scheme
Institution	SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES
Principal Investigator	RAJINIKANTH V

	(9444213777 rajinimit@gmail.com)
Project Cost & Duration	Rs. 42,77,500.00 (Rs.38,57,500.00 (MoM) + Rs.4,20,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.4,20,000.00
Objectives of the project	The global population surge drives heightened natural resource utilization, leading to innovative methods for optimization. Escalating demand for minerals and metals necessitates exploration, alternative sourcing, and recycling. Recycling, vital for reusing metals, is pivotal in various industries for efficient technology use. This project introduces a Digital Detection Scheme (DDS) for real-time sorting of metal scraps using integrated cameras and AI. Widely adopted in recycling facilities, it enhances efficiency and reduces manual labor. The system, incorporating a monitoring unit with a camera, motor, and belt drive, scans scrap surfaces with a visible/thermal camera. It excels in separating metals, distinguishing magnetic from non-magnetic materials. Key aspects include developing a deep learning-based scrap detection system focusing on shape, texture, and color, validated using a 50MP digital camera image database. Integration seamlessly merges with the visible/thermal camera-based image scanner system. Experimental testing involves moving scrap on the conveyor belt drive system, ensuring accurate detection and segregation. This project addresses rising metal demand with advanced recycling technology, contributing to environmentally conscious and technologically advanced industries.
REMARKS/SUGGESTION:	
PI was ABSENT	
NOT RECOMMENDED	

12.	
Project No.	SNTMOM/985/2023
Project Title	Development of environmentally benign and efficient process technology for the recovery of Gallium (Ga) from end of life (EoL) LEDs
Institution	Indian Institute of Technology Madras, Centre for Materials for Electronics Technology Hyderabad
Principal Investigator	Lakshman Neelakantan Thro – VC (8939083564 nlakshman@iitm.ac.in)
Project Cost & Duration	Rs.1,08,47,444.00 3 Years,

Industry /Contribution	Partner	Not mentioned.
Objectives of the project		Considering the expected demand for the use of LEDs worldwide, specifically in India and the disposal problems associated with these solid wastes and limited primary production, the recovery of Ga from LEDs significantly impacts the environment and economy. Hence, the objective of the present study is: 1. To develop environmentally friendly recycling technology for the extraction of Ga from LEDs 2. To study the drawbacks of the existing recovery process and modify it for better yield 3. To optimize the process variables using alternative solvents and processing methods and 4. To predict the scale-up condition of the process Gallium is present in the LED chip as gallium nitride. After burning the polymeric parts, the LEDs were disassembled and crushed, and then the chip was separated from the LED. Conventional hydrometallurgical Ga recovery methods are easy to operate and flexible, but the use of solvents and corrosive acids is again a concern as waste with hazardous substances, which needs further research. Thus, the proposal aims to identify an eco-friendly, efficient alternative processing procedure for gallium recycling from waste-/end of life (EoL) light-emitting diodes (LED) by a smart combination of pyro- and hydro-metallurgical routes.
REMARKS/SUGGESTION:		
<ul style="list-style-type: none"> • The project proposal is below TRL-3 • No experiments performed and economically not feasible • Proof of concept is missing 		
NOT RECOMMENDED		

13.		
Project No.		SNTMOM/991/2023
Project Title		An optimal approach for the retrieval of value-added substances from secondary aluminum black dross
Institution		SNR SONS CHARITABLE TRUST, Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator		Bhagyanathan Chandragandhi Thro VC
Project Cost & Duration		Rs. 56,64,534.00 (Rs.48,14,534.00 (MoM) + Rs.8,50,000.00 Industry Partner) 2 Years,
Industry /Contribution	Partner	Rs.8,50,000.00
Objectives of the project		Develop the proposed hybrid pyro-hydrometallurgy techniques for the extraction of value-added substances from secondary aluminum black dross. To maximize the recovery of valuable materials from secondary aluminum black dross, with a particular focus on high-quality alumina and other valuable

	components. To convert the aluminium dross into flux as a degassing/detoxing agent suitable for industrial applications
REMARKS/SUGGESTION:	
<ul style="list-style-type: none"> • The proposal is above TRL 3 and scalability is possible to achieve. • PI presented proof of concept and proposal is novel 	
RECOMMENDED	

14.	
Project No.	SNTMOM/992/2023
Project Title	An inexpensive protective coating for inhibition of copper oxidation by using in-house synthesized graphene
Institution	National Institute of Technology Rourkela, National Institute of Technology Raipur
Project Cost & Duration	Rs. 39,03,938.00 (Rs.31,23,150.00 (MoM) + Rs.7,80,788.00 Industry Partner) 3 Years,
Principal Investigator	Archana Mallik
Industry Partner /Contribution	20%
Objectives of the project	In-house synthesis of functionalized graphene from commercially available graphite. • Develop a coating methodology that effectively prevents oxidation on copper surfaces. The developed coating is expected to be cost-effective, environmentally friendly, and easy to apply. • Conduct comprehensive testing to assess the coating's protective behaviour towards oxidation, durability, and adhesion. • Optimize the coating for higher inhibition of the oxidation process.
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. PI should also focus on electrical properties which should not be lost or minimized. 2. Coating process is possible to be used; Proposal needs to be revised significantly. 3. PI advised to contact NFTDC for suggestions and guidance for an entirely new proposal. 	
NOT RECOMMENDED	

15.	
Project No.	SNTMOM/993/2023
Project Title	Sustainable Manufacturing of automobile engine pistons with 100 percent recycled aluminium alloys with extended Fe-impurity tolerance
Institution	BML Munjal University, Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	Kameswari prasada rao ayyagari
Project Cost	Rs.1,29,77,500.00

& Duration	(Rs.1,10,27,500.00 (MoM) + Rs.19,50,000.00 Industry Partner) 2 Years,
Industry Partner /Contribution	Rs.19,50,000.00
Objectives of the project	Develop a prototype piston for automobiles using recycling friendly aluminium alloy with high iron content • Validation of piston prototypes
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. Project idea is good; 2. But PI has not covered the required alloys; 3. The work plan should cover different types of scraps which bring in other impurities. 4. Piston and Rings manufacturing companies should be contacted and more companies can be brought together as pre-competitive work in a consortium. 5. Budget needs re-look as there is a significant capital equipment is asked for which is normally available in participating industry partners or such partners should be chosen 6. Recommended for resubmission after consortium formation. 	
PI WAS ADVISED TO RESUBMIT THE PROPOSAL AFTER REVISION OF THE PROPOSAL.	

16.	
Project No.	SNTMOM/994/2023
Project Title	Development of a two-stage e-waste segregation system using transfer learning
Institution	Visvesvaraya National Institute of Technology Nagpur
Principal Investigator	ABHINAV ARYA
Project Cost & Duration	Rs.11,83,000.00 (Rs.9,53,000.00 (MoM) + Rs.2,30,000.00 Industry Partner) 2 Years,
Industry Partner /Contribution	Rs.23,00,00.00
Objectives of the project	The objective of this research proposal is to provide an innovative approach in electronic waste (e-waste) management. The research aims to design and implement an affordable sorting technology by incorporating transfer learning principles into the object detection model. The central focus is on optimizing the efficiency and reducing costs associated with e-waste sorting on conveyor belts. Within this undertaking, we plan to construct a dual-stage conveyor belt system equipped with high-definition cameras to scan e-waste. Following image analysis by the machine learning model, the e-waste will

	<p>undergo segregation. The identified valuable materials will then progress to the subsequent stage of the conveyor belt system, where further sorting will be conducted based on color, size, and shape of different metals such as copper, and steel and non-metals. Traditional sorting methods relying on manual labor are labor-intensive, costly, and face scalability challenges as e-waste volumes rise. The proposed research addresses this by exploring advanced sorting technologies. Leveraging machine learning, particularly the YOLO (You Only Look Once) model, offers a promising automated alternative. Transfer learning with YOLO enables the model to leverage pre-existing knowledge, enhancing its ability to recognize and categorize diverse e-waste materials. This approach not only accelerates the development process but also minimizes the requirement for extensive labeled datasets. The proposed technology seeks to provide a cost-effective solution for e-waste management as most of similar technology relies heavily on the robotic arm and is very costly. This cost-effective solution will provide accessibility and affordability, especially in regions with limited resources. The technology will be useful for Municipal Waste Management Authorities, Environmental Regulatory Agencies, E-Waste Recycling Facilities, Technology and Research Institutions, and other related organizations.</p>
<p>REMARKS/SUGGESTION:</p> <ol style="list-style-type: none"> 1. Project idea is good and cost effective compared to multiple robot interventions or large scale manual segregation. 2. Project deliverables will likely to lead to efficient system level e waste segregation 3. The number of stages presently identified as 2 level can be increased as per need and waste aggregation. 4. Idea is extendable to other waste segregation methods 	
RECOMMENDED	

17.	
Project No.	SNTMOM/1008/2023
Project Title	Quantum Confinement Technology Powered Advanced High Throughput Hydrometallurgical Separation of the Rare Earths to Pilot TRL 5 to 7
Institution	Banaras Hindu University, Non Ferrous Materials Technology Development Centre
Principal Investigator	Somenath Garai (8400098731 sgarai@bhu.ac.in)
Project Cost & Duration	Rs.89,20,800.00 (Rs.74,20,800.00 (MoM) + Rs.15,00,000.00 Industry Partner) 2 Years,
Industry Partner /Contribution	NFTDC Rs. 15,00,000.00

Objectives of the project	<p>Synthesizing Icosidodecahedral-based Quantum Containers and other Quantum clusters through self-assembly in 10 KG batches along with indigenously synthesizing various extraction solvents through an effective route. 2. The meticulous evaluation of Dissociation Constants (KD(s)) and Separation Factor for rare earth elements, contrasted against differentially charged cations, assumes a paramount role in the grand domain of nano-engineering for designing and packing of differential REE absorption columns. 3. The validation of Nano-Keplerate's prodigious throughput recyclability in real-life bulk nanotechnology applications becomes an imperative task. The establishment of a 100 L/Batch upscaled hydrometallurgical unit stands as a testament to the perceptible viability of this nanostructure. 4. Determining the essential parameters for column preparation and functionalization and optimization for bulk scale application. 5. Elucidation of techno-commercial viability for conventional intra-separation for REE. 6. Quantum technology for intra separation of REEs will scale up with support from NFTDC for pilot validation. Following successful validation, a joint Start-Up with NFTDC will boost indigenous REE beneficiation under Atmanirbhar Bharat for Skill India</p>
<p>REMARKS/SUGGESTION:</p> <ol style="list-style-type: none"> 1. Project idea is novel 2. Good amount of prior work is done and the critical TRL-3 has been achieved. 3. Project aims to pilot plant demonstration at 10 kg/batch or 100L/day and even up to 100 gpl solutions containing mixed RE feed is the final deliverable. 4. Project execution plan is presented with NFTDC as partner which ensures both the input materials as well as process facility building and other analytical facilities. 5. A start – up being envisaged towards the second year of the project which will enable commercialization 	
<p>RECOMMENDED</p>	

18.	
Project No.	SNTMOM/1015/2023
Project Title	HVOF based coatings for preventing erosion corrosion of steel components used in pumps and other mining components
Institution	Indian Institute of Technology Bhubaneswar
Principal Investigator	<p>Srikant Gollapudi (9566288703 srikantg@iitbbs.ac.in)</p>
Project Cost & Duration	<p>Rs.54,44,517.00 (Rs.44,44,517.00 (MoM) + Rs.10,00,000.00 Industry Partner)</p> <p>3 Years</p>
Industry Partner /Contribution	<p>Paradeep Phosphates Limited Rs. 10,00,000.00</p>

Objectives of the project	Deposit Nickel Chromium-Chromium Carbide and Stellite coatings on Sanicro 28 steels using High Velocity Oxy Fuel technique Studying the effect of process parameters on the structure, surface roughness, porosity, phase composition, hardness and erosion corrosion behavior of the coatings Demonstration of the performance of the coatings through on site studies involving determination of the useful service life of the pump impellers and vane parts
PI was ABSENT	
NOT RECOMMENDED	

19.	
Project No.	SNTMOM/1018/2023
Project Title	Detection of metal from scraps using electrochemical coupled plasmonic structures
Institution	Indian Institute of Science Bengaluru
Principal Investigator	Abha Misra (9449682451 abha@iisc.ac.in
Project Cost & Duration	Rs.1,47,55,000.00 (Rs.1,22,55,000.00 (MoM) + Rs.25,00,000.00 Industry Partner) 3 Years
Industry Partner /Contribution	Name of Industry- M/s Sinsil International, Bengaluru - 560 049, INDIA Rs.25,00,000.00
Objectives of the project	To detect low quantities (μg to mg) of metals in scraps cost-effectively. In addition, detecting the constituent metals using two different detection procedures simultaneously increases the overall precision and accuracy of the detection. Development of prototype for the field testing. Exploitation of developed technique under different environment conditions like liquid and air. Deployment of the development in the industries.
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. The aim of the proposal is a sensor development 2. Domain knowledge of scarp /waste related is needed for execution of this project with a partner Co-PI or another institution. 3. PI should undertake significant preliminary work which is directly related to the envisaged proposal 4. Budget outlay is very high. 5. Electronic waste should also be covered 	
NOT RECOMMENDED	

20.	
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Project No.	SNTMOM/1023/2023	
Project Title	Light weightening of Mining Excavators out of Rheo pressure die cast and Rheo-rolled Al-15Mg2Si-4.5Si composite	
Institution	Indian Institute of Science Bengaluru	
Principal Investigator	Prosenjit Das (7908593077 prosenjitdas@iisc.ac.in)	
Project Cost & Duration	Rs. 2,46,47,268.00 (Rs.20947268.00 (MoM) + Rs.37,00,000.00 Industry Partner) 3 Years,	
Industry Partner /Contribution	Rs. 37,00,000.00	
Objectives of the project	Design and development of the Shear cooling roll (SCR) based Rheo gravity die casting as well as Rheo pressure die casting set-up. 2. Development of hypereutectic Al-15Mg2Si-4.5Si composite, with suitable alloying additions such as Sr, B, Cu, Li etc., as well as development of Rheo gravity die casting, Rheo pressure die casting as well as Rheo-rolling processes. 3. Design, analysis and finalization of appropriate product sizing of the prototype Excavator Connecting rod as well as scaled prototype of Excavator arm and boom, and subsequent design and manufacturing of permanent metallic moulds, fixturing arrangements etc. 4. Development of Rheo pressure die cast Connecting rod as a prototype Excavator engine component as well as scaled prototype of Excavator arm and boom out of the proposed SCR based RGDC Al-15Mg2Si-4.5Si composite.	
REMARKS/SUGGESTION:		
<ol style="list-style-type: none"> 1. Project idea is good 2. PI should Look at the feasibility of low pressure die casting. High pressure die casting requirement makes the capex requirements for companies very high. 3. PI is advised to look at components that are directly related to aluminium alloys rather than compete with steel components which withstand corrosion in very dirty mining service conditions. 4. CAPEX requirements in this project are very high and industry co-funding is not there. 5. PI is advised to look at developing a consortium of a few companies in a pre-competitive set up for significant co-funding and then consider re-submission. 		
PI WAS ADVISED TO RESUBMIT THE PROPOSAL AFTER REVISION OF THE PROPOSAL.		

21.	
Project No.	SNTMOM/1025/2023
Project Title	Development of AI-based computer vision scrap sorting system for aluminium alloy scrap

Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	Vimal Kishor Jha (9923794481 vkjha@jnarddc.gov.in)
Project Cost & Duration	Rs. 1,52,09,200.00 (Rs.1,29,44,200.00 (MoM) + Rs.22,65,000.00 Industry Partner) 2 Years,
Industry Partner /Contribution	Rs. 22,65,000.00
Objectives of the project	Artificial Intelligence based computer vision methodology using visible imaging for precise sorting of aluminium and its alloy scraps. b. Fabricating a sorting system based on the methodology developed
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. Project idea is good 2. PI should rework the proposal so that the final developed instrument can be economical 3. Recommended for resubmission in collaboration with VIT wherein the complementary core competence in vision based systems and AI-ML is significant. 	
PI WAS ADVISED TO RESUBMIT THE PROPOSAL AFTER REVISION OF THE PROPOSAL.	

22.	
Project No.	SNTMOM/1027/2023
Project Title	Utilisation of aluminium dross in synthetic slag preparation for secondary steel making
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal Investigator	RAM NARAYAN CHOUHAN (9422124941 rnchouhan@jnarddc.gov.in)
Project Cost & Duration	Rs. 91,12,500.00 (Rs. 77,47,500.00 (MoM) + Rs.13,65,000.00 Industry Partner) 2 Years
Industry Partner /Contribution	Rs. 13,65,000.00
Objectives of the project	Develop synthetic slag for deep steel desulphurisation using aluminium dross residues 2. Develop SOP for synthetic slag preparation from aluminium dross residues
REMARKS/SUGGESTION:	

1. Project is far below TRL level 3 and it is only at ideas stage now.
2. Proof of concept is missing and a lot of prior work is needed to be done.
3. Project requires high T processes and equipment which can render techno-economics as well as scalability as being difficult.

NOT RECOMMENDED

23.	
Project No.	SNTMOM/1037/2023
Project Title	Production of hydrogen and pure aluminium using aluminium dross
Institution	Indian Institute of Technology Guwahati
Principal Investigator	Farrukh Khalid (9897273709 f.khalid@iitg.ac.in)
Project Cost & Duration	Rs.56,85,584.00 (Rs.31,85,584.00 (MoM) + Rs.25,00,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs. 25,00,000.00
Objectives of the project	The main objectives of this project are as follows: 1. Design and development of an experimental setup and technological testing for the co-production of green hydrogen and pure aluminium from dross using a thermochemical cycle. 2. Development of an analytical model for the dross to hydrogen production process, electrolytic step, and validation with experimental results. 3. Energy, exergy, cost, and life cycle assessment of the cycle and its comparison with existing technologies.
REMARKS/SUGGESTION:	
<ol style="list-style-type: none"> 1. Dross comes with a lot of impurities depending on the alloy that is being produced 2. Thermo-chemical process to produce chlorides is not an efficient way to product aluminium 3. Quantity of H2 produced per kg will not be commensurate 4. Other impurities removal will require distillation unit processes and it will render techno-economics unviable. Aluminium chloride process is still an academic exercise 5. PI has not worked with actual Al dross and significant prior work needs to be done by PI 6. There are other valuables such as hydroxide, alumina can be recovered from dross as being attempted in other projects rather than aluminium. 	
NOT RECOMMENDED	

24.	
Project No.	SNTMOM/955/2023

Project Title	Deep Eutectic Solvent based process for Recovery of Cu from Spent Batteries and REE from Recycling of end-of-life NdFeB Magnets
Institution	
Principal Investigator	Hemlata K. Bagla (9821420698 hemlata.bagla@kccollege.edu.in)
Project Cost & Duration	Rs.74,40,100.00 3 Years,
Industry /Contribution	Partner NIL
Objectives of the project	<p>The two objectives of this project proposal is to recover copper from solution from leach liquor of LiB with collaboration with NFTDC. Previously, we have presented the project in 22nd PERC (Project Evaluation & Review Committee) meeting held under the Chairmanship of Shri Upendra C. Joshi, Joint Secretary, Ministry of Mines during 3–5 Aug, 2022 through VC. It was recommended in minutes of meeting that: Idea is novel and aims for zero waste. PI should approach NFTDC for facility utilization and project guidance. In the present work, copper from the spent batteries leach liquor will be recovered by hydrophobic deep eutectic solvent bases solvent extraction process in collaboration with NFTDC. These extractive deep eutectic solvents will be prepared by using a hydrogen bond acceptor choline chloride and hydrogen bond donor oximes such as 2-hydroxy-5-nonylacetophenone oxime, 5-(tert-butyl)-2-hydroxybenzaldehyde oxime, 5-nonylsalicylaldoxime. The second objective is to recover REE (Nd, Pr, Dy) from end-of-life NdFeB permanent magnet using new emerging green solvent Deep Eutectic Solvent. Neodymium magnets (NdFeB) contains 50–60% of iron, 25–30% of rare-earth elements (mainly neodymium) and around 1% of B. Other elements, such as Al, Ga, Co, Nb, Si, Zr, Ni, Cu, Zn are used as minor additives in order to improve thermal, magnetic or corrosion properties of these magnets. In the present project, the hydrometallurgy-based recycling of NdFeB would be develop using deep eutectic solvent (DES). The main steps in hydrometallurgy include demagnetization, mechanical pre-treatment, leaching, precipitation, and solvent extraction. The DES will be used for selective leaching of REE from NdFeB, and subsequent purification by solvent extraction using hydrophobic deep eutectic solvent. The present project envisaged recovery of REE, Fe, B, other metals and acids leading to zero waste discharge, and economically and environmentally viable recycling process.</p>
REMARKS/SUGGESTION:	

Not Recommended	<ol style="list-style-type: none"> 1. No proof of concept and lab data. 2. There is no Industry Partner 3. Commercial plant in similar lines is already existing.
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25.	
Project No.	SNTMOM/961/2023
Project Title	Process for production of ATH with high whiteness using non-metallurgical grade bauxite by following soda sintering process
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre, Institute of Chemical Technology Mumbai
Principal Investigator	PRACHIPRAVA PRADHAN (9438760367, prachi@jnarddc.gov.in)
Project Cost & Duration	Rs.79,95,750.00 (Rs.69,95,750.00(MoM) + Rs.10,00,000.00 Industry Partner) 2 Years,
Industry Partner /Contribution	NIKNAM Chemicals PVT. LTD Rs.10,00,000.00
Objectives of the project	i) Development of a know-how for production of alumina hydrate with high whiteness from non-metallurgical grade bauxite from Madhya Pradesh/Gujarat; following soda sintering route. In the first reaction, sodium carbonate reacts with alumina hydrate from bauxite at high temperature of 1100-1300oC to get sodium aluminate. In a similar way, sodium carbonate reacts with silica to form sodium silicate and quick lime reacts with silica to form calcium silicate. Here calcium oxide is used for efficient removal of silica. The high temperature helps in eliminating organic carbon thus producing pure sodium aluminate which is leached out from the composite material and is used for precipitation to generate white ATH. (ii) Evaluation of the product hydrate properties. (iii) Bench scale study using 10-15 kg bauxite. (iv) Mass balance. (v) Kinetics studies and simulation. (vi) Validation of optimum conditions and product.
REMARKS/SUGGESTION:	
Recommended modifications with	<ol style="list-style-type: none"> 1. Project idea is good. 2. Deliverable should include work on Mass balance and whiteness of 97% should be achieved. 3. Work plan should include pre-feasibility study. 4. The project is recommended for a revised cost of Rs. 69 Lakhs- MOM- Rs 59 lakhs+ 10 lakhs Industry partner.

26.	
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Project No.	SNTMOM/967/2023	
Project Title	Synthesis of precipitated silica from waste beach sand tailings and its value addition in glass making industries	
Institution	SOCIETY RAMAN EDUCATION	
Principal Investigator	SUNITA ROUTRAY (7327847963 sroutray1@cvrce.edu.in)	
Project Cost & Duration	Rs. 32,96,700 (Rs.28,92,195.00 (MoM) + Rs.4,04,505.00 Industry Partner) 2 Years,	
Industry Partner /Contribution	Indian Rare Earths Limited (IREL) Rs.404505.00	
Objectives of the project	To carry out value addition of waste beach sand tailings 2. To generate wealth from waste 3. To produce precipitated silica 4. To utilize of precipitated silica for industrial applications especially in glass making industries	
REMARKS/SUGGESTION:		
Recommended with conditions.	<ol style="list-style-type: none"> 1. Project idea is good. 2. Industry support letter has no mention about 15% funding. 3. Deliverables should not be restricted only to the glass Industry, as it can have other applications like semiconductors. 4. Recommended subject to 15% financial support letter from industry by 15th Dec 2023. 5. Work plan should include 99.99% purity silica. 	

27.		
Project No.	SNTMOM/970/2023	
Project Title	Enhanced selective recovery of selenium and tellurium from copper anode slime using secondary mineral waste	
Institution	Maulana Azad National Institute of Technology Bhopal	
Principal Investigator	Suresh Sundaramurthy (9244184604 sureshs@manit.ac.in)	
Project Cost & Duration	Rs.31,44,036.00 (Rs.29,44,036.00 (MoM) + Rs.2,00,000.00 Industry Partner) 3 Years,	
Industry Partner /Contribution	Rs. 2,00,000.00	
Objectives of the project	<ol style="list-style-type: none"> 1. Main aim of this research will be to selective recovery of selenium (Se)/tellurium (Te) from copper anode slime using secondary mineral wastes (such as mineral waste from Mn recovery plant, dry solid from WTP (Al powder), and MEE/ATFT of textile industry (Glauber salt)). 2. Taguchi's design of experiment will be followed for optimization of 	

	<p>parameters for ultrasound-assisted ortho-phosphoric acid leaching in presence of mineral waste for Se/Te recovery. 3. Optimize process parameters through Taguchi's design of experiments such as different liquid to solid ratio (L/S) (2:1, 2.5:1, 3:1, 4:1, 5:1), ortho-phosphoric acid concentration (1.02, 1.28, 1.53, 1.79 and 2.04 mol/l), pH (4.0, 5.0, 6.0, 7.0, 8.0), power of ultrasound (300, 500, 600, 800 and 1000 W), ultrasound time (2h, 4h, 6h, 8h,12h), and temperature (130 0C, 150 0C, 180 0C, 230 0C, 260 0C) on Se/Te recovery from copper anode slime. 4. Experiments will be also performed in order to investigate the effect of quantity of RO reject for recovery of AgCl, dry solid from WTP (Al powder) for SeO3²⁻/or TeO3²⁻ reduction and Se/Te recovery, and extracting copper on dry solid from MEE/ATFT of textile industry (Glauber salt). 5. Kinetic and thermodynamic studies will be conducted on Se/Te recovery. Main phases of the samples will be identified by X-ray diffraction. 6. Concentrations of Cu, Se, Ag, and Te will be analysed by inductively coupled plasma optical emission spectroscopy. 7. Morphology and element distribution behaviours in the copper anode slime are determined by SEM–EDS. 8. Chemical composition of residues will be analysed by X-ray fluorescence spectrometry. 9. Publications 10. Reporting</p>
REMARKS/SUGGESTION:	
Recommended conditions.	with
	<ol style="list-style-type: none"> 1. Project idea is good. 2. There are labs who have already achieved Pilot Scale. 3. Industry support letter has no mention about 15% funding which needs to be submitted by 15th Dec 2023. 4. Since it is related to HINDALCO, a letter of interest from HINDALCO should also be submitted by 15th Dec. 2023.

28.	
Project No.	SNTMOM/977/2023
Project Title	A Sustainable Approach to Waste Valorization - Design Pilot Scale Reactors for Conversion of Black Aluminium Dross to Hydrogen Fuel
Institution	Indian Institute of Information Technology Design and Manufacturing Kurnool
Principal Investigator	D AMARANATHA REDDY (9985577335 drreddy@iiitk.ac.in)
Project Cost & Duration	Rs.36,10,600.00 (Rs.28,85,600.00 (MoM) + Rs.7,25,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.7,25,000.00
Objectives of the project	In the present Research proposal, we aim to address the waste-to-wealth concept by converting black aluminium dross into a

	valuable resource for high-purity hydrogen production. The objectives encompass a holistic approach, from understanding the raw material's composition to designing a scalable and efficient reactor, ensuring both economic viability and environmental sustainability. Objective 1: Investigate the Composition of Black Aluminium Dross In this phase, we aim to analyze the chemical composition of black aluminium dross. Through advanced spectroscopic techniques, we will identify key elements, compounds and their potential for hydrogen production. Objective 2: Optimize Pre-treatment Processes for Black Aluminium Dross We will develop efficient pre-treatment methods to enhance the reactivity of black aluminium dross. By exploring various techniques such as leaching, roasting, and chemical modification, we aim to improve the accessibility of aluminium in the dross for subsequent
REMARKS/SUGGESTION:	
Not Recommended	<ol style="list-style-type: none"> 1. Proof of concept is missing. 2. PI has not submitted any details about analysis of black aluminum dross. 3. There are no details about experiments on Hydrogen emission.

29.	
Project No.	SNTMOM/983/2023
Project Title	Characterisation and extraction of lithium oxide from khondalite rocks bauxite and its residue red mud from different deposits of India
Institution	SOCIETY RAMAN EDUCATION
Principal Investigator	Ranjita Swain (9556779520 ranjitaswain@cvrce.edu.in)
Project Cost & Duration	Rs.52,56,160.00 3 Years
Industry Partner /Contribution	NIL
Objectives of the project	To extract LiO ₂ from Khodalite rock, bauxite and bauxite residue for its application in various industrial application specific reference to lithium battery. • To explore and implement innovative pathways, in collaboration with Algal Earth industry, for carbon dioxide capture, and making the extraction process carbon neutral.
REMARKS/SUGGESTION:	

Not Recommended	<ol style="list-style-type: none"> 1. Proof of concept and initial study on raw material is missing 2. No clarity on objectives. 3. Study of parent rock for Li content is missing. 4. The minimum 15% industry funding is not available
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30.	
Project No.	SNTMOM/999/2023
Project Title	A process for preparation of cost-effective nanofluid from bauxite wastes and ferrous-based tailings for HVAC application
Institution	Balaram Panda Trust
Principal Investigator	Amar Kumar Das (9437436972 amar.das120@gift.edu.in)
Project Cost & Duration	Rs.25,03,800.00 (Rs.2003800.00 (MoM) + Rs.5,00,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs. 5,00,000.00
Objectives of the project	The following objectives of the project have been enlisted: 1. To synthesize Al ₂ O ₃ / Fe ₂ O ₃ nanoparticles from iron ore tailings (Hematite, 50-150nm) and bauxite residue with reasonable particle size distribution using the simplest preparative methods. 2. To study the morphology of the iron tailings and upgrade the purity of nanoparticles (spherical shape for higher surface area). 3. To study the effectiveness of Al ₂ O ₃ / Fe ₂ O ₃ nanoparticles as coolant/refrigerant for HVAC applications. 4. To conduct laboratory trials to evaluate the efficiency and effectiveness of heat exchangers.
REMARKS/SUGGESTION:	
Recommended	<ol style="list-style-type: none"> 1. Project idea is good. 2. PI is trying to use mineral waste as a nano-fluid 3. Some previous work also presented.

31.	
Project No.	SNTMOM/1001/2023
Project Title	White Hydrogen from scrap aluminum dross transforming industrial waste into a fuel source for the future
Institution	Institute of Chemical Technology Mumbai IndianOil Campus Bhubaneswar
Principal Investigator	Pyarimohan Dehury
Project Cost & Duration	Rs.91,65,200.00 (Rs.7790420.00 (MoM) + Rs.13,74,780.00 Industry Partner) 3 Years,

Industry /Contribution	Partner	Rs.13,74,780.00
Objectives of the project	The principal objective of the proposal is to develop an automated pilot plant for the production of while hydrogen from waste aluminum dross. The process includes a series of unit operations (crushing, grinding, separation) and unit processes (hydrolysis, acid treatment).	
REMARKS/SUGGESTION:		
Recommended conditions.	with	<ol style="list-style-type: none"> 1. Project ideas is good and innovative. 2. The process is using a common salt solution for generating hydrogen and ATH is produced as a by-product from aluminium waste. 3. PI also presented lab scale work carried out using Vedanta dross. 4. The deliverables should include characterization of ATH and details flow sheet with mass balance. 5. PI has to submit 15% industry funding letter by 15 Dec 2023 and look into possible reduction in the cost.

32.		
Project No.	SNTMOM/1009/2023	
Project Title	Center of Excellence in Rare Earth Elements (REEs) from Coal and Derived Wastes	
Institution	Indian Institute of Technology Dharwad	
Principal Investigator	Suvamay Jana (9330261883 suvamay.jana@iitdh.ac.in)	
Project Cost & Duration	Rs.38,48,97,000.00 4 Years,	
Industry /Contribution	Partner	M/s Vedanta Ltd. Jharsuguda Contribution-NIL
Objectives of the project	Our primary goals in this proposed research are to fill knowledge gaps by exploring coal mines and waste sites for REEs in various parts of India, to fill technology gaps related to REE processing by developing green processes for REE separation, and finally to discover new opportunities for REE utilization that will significantly mitigate REE supply chain issues and benefit the Government of India's "Make in India" concept. Accordingly, the themes and related objectives that are included in this proposal are stated below: Theme-1: Rare Earth Element Exploration • Identification and Quantification of REEs in the Coal mines and the Waste Sites in the State of Maharashtra Here we aim to collect and analyze samples from open-cast coal mines	

	<p>and surrounding waste sites that are under the Western Coalfields Ltd of Coal India Ltd, such as Gondagaon, Bhanegaon, Singori, Adasa, and Inder-Kamptee in the Nagpur District. In addition, the fly ash produced by the nearby Koradi and Khaperkheda thermal power plants will be investigated.</p> <p>Theme-2: Rare Earth Element Processing • Development of Deep Eutectic Solvent based Efficient Liquid-Liquid Extraction Method for REE Separation Here, we seek to develop a pilot model for liquid-liquid extraction (LLE) with optimized process parameters using eco-friendly green hydrophobic deep eutectic solvents (HDESs) instead of toxic and carcinogenic conventional organic diluents. • Development of Protein-Based Bioseparation Technology for REE Enrichment and Purification We will discover novel soluble, pure, and robust recombinant proteins for REE sensing, and intra-REE separation, even when REE concentration is in picomolar range. Theme-3: Rare Earth Element Utilization • Utilization of REEs as Photocatalysts for Various Applications We aim to synthesize REEs doped heterogeneous photocatalysts for challenging chemical transformations including methane activation for syngas production, water splitting for hydrogen production</p>
REMARKS/SUGGESTION:	
Not Recommended	<ol style="list-style-type: none"> 1. Proof of concept is missing. 2. PI has not carried out any preliminary work on characterization of raw materials. 3. The minimum 15% industry funding is not available 4. The project is more of a capital building exercise.

33.	
Project No.	SNTMOM/1012/2023
Project Title	Unique high throughput technology development for the lithium ore beneficiation
Institution	Indian Institute of Technology ISM Dhanbad
Principal Investigator	Pankaj Kumar Jain (7766904994 panku@iitism.ac.in)
Project Cost & Duration	Rs.1,07,96,500.00 (Rs.1,03,96,500.00 (MoM) + Rs.4,00,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.4,00,000.00
Objectives of the project	1. Characterization of selected Li ore deposit 2. Beneficiation study to generate high-grade lithium concentrate 3. Development of process flowsheet with equipment selection for 50tph processing plant
REMARKS/SUGGESTION:	

Not Recommended	<ol style="list-style-type: none"> 1. PI has not undertaken any preliminary work. 2. No data for characterization is present. 3. Project deliverables lack clarity with regards to raw materials.
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34.	
Project No.	SNTMOM/1013/2023
Project Title	Development of integrated physical beneficiation, chemical roasting and hydrometallurgical processes to recover rare earths from fly ash
Institution	Birla Institute of Technology and Science Pilani, CSIR Institute of Minerals and Materials Technology
Principal Investigator	SAROJ SUNDAR BARAL (9767022314 ssbaral@goa.bits-pilani.ac.in)
Project Cost & Duration	Rs.61,26,600.00 (Rs.47,26,600.00 (MoM) + Rs.14,00,000.00 Industry Partner) 3 Years
Industry Partner /Contribution	M/s Vedanta Ltd. Jharsuguda Rs. 14,00,000.00
Objectives of the project	Collection, characterization and physical beneficiation of the fly ash as pre-concentration steps. ? To develop sequential chemical roasting, water leaching and chemical leaching of REEs from fly ash. ? To optimize the chemical roasting, water leaching, and acid leaching processes for maximal REE recovery and study the effect of various roasting additives on the transformation of fly ash phases. ? Design of standard operating procedure for 250 mL batch shake flask bioleaching process and optimization of leaching parameters. ? To develop and solve an economic model-based optimization problem for acid and alkali-based leaching processes, focusing on the fine-tuning of kinetic parameters.
REMARKS/SUGGESTION:	
Not Recommended	<ol style="list-style-type: none"> 1. Proof of concept is missing. 2. Similar work done upto pilot level without bioleaching.

35.	
Project No.	SNTMOM/1014/2023
Project Title	Setting up of a 100 kg Coal Fly-ash Pilot Processing unit to extract high-purity fumed Silica and Aluminium fluoride from CFA
Institution	Jawaharlal Nehru Aluminium Research Development and Design Centre
Principal	Manoj Tukaramji Nimje

Investigator	(0992129423 mtnimje@jnarddc.gov.in)
Project Cost & Duration	Rs.3,75,75,000.00 (Rs.3,00,75,000.00 (MoM) + Rs.75,00,000.00 Industry Partner) 1 Years, 6 Month
Industry Partner /Contribution	Rs. 75,00,000.00 (Ministry of Power)
Objectives of the project	The main objective of the project is to set up a 100 kg CFA (Coal Fly Ash) pilot processing unit for the extraction of high-purity fumed silica (>99.9 %) and Aluminium fluoride (>98%) based on the encouraging results of the previous work carried out on a bench scale at JNARDDC. This helps pave the way for the commercialization of the process.
REMARKS/SUGGESTION:	
Recommended with conditions.	<ol style="list-style-type: none"> 1. Project idea is good 2. Bench scale results are encouraging. 3. Deliverables should include validation for commercial characterization of silica and AlF₃ at industry. 4. Project is recommended subject to the mandatory funding by Ministry of Power

36.	
Project No.	SNTMOM/1016/2023
Project Title	Biomining of Germanium from Pb-Zn circuit and development of Germanium nano-ink
Institution	JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY
Principal Investigator	Sudhir Kumar (9805627899 sudhir.syal@juit.ac.in)
Project Cost & Duration	Rs.20,68,500.00 (Rs.17,73,000.00 (MoM) + Rs.2,95,500.00 Industry Partner) 2 Years
Industry Partner /Contribution	M/s EXIGO Recycling Pvt. Ltd., New Delhi Rs. 2,95,500.00
Objectives of the project	Biomining of Ge from Pb-Zn circuits and e-waste sources. 2. To develop Ge-functional nano-ink from recovered Germanium (Ge)
REMARKS/SUGGESTION:	

Not Recommended	<ol style="list-style-type: none"> 1. PI has not undertaken any preliminary work on characterization of Ge including recovery of Ge. 2. PI is not clear about the starting material and no analysis has been done. 3. Project deliverables lack clarity specially with regards to advantages of bioleaching.
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37.	
Project No.	SNTMOM/1020/2023
Project Title	Dry Beneficiation Studies on a low-grade Wollastonite by indigenously designed and newly developed Shape Separator for its commercial application
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	Santosh Deb Barma (0859695813 sdbarma@immt.res.in)
Project Cost & Duration	Rs. 61,88,500.00 (Rs.51,88,500.00 (MoM) + Rs.10,00,000.00 Industry Partner) 2 Years
Industry Partner /Contribution	Rs. 10,00,000.00
Objectives of the project	We propose to process wollastonite based on dry beneficiation techniques consisting of a series of significant outputs and achievements as follows: • The process is completely based on dry beneficiation techniques • The quality of the products meets the industry standards • An in-house new equipment has been designed and developed by CSIR-IMMT for the dry processing of wollastonite ore. This equipment has been named a shape separator. Looking into the growing demand for wollastonite across the globe, it is important to upscale this work forward to higher TRL (TRL-7) which will not only help in delivering the developed process into full-ledge commercial technology but also help in complying with the moto of Atmanirbhar Bharat. Our main objectives are • To develop a techno-economic dry beneficiation process of low-grade wollastonite ore • Upscaling and validation of design and development of an indigenously developed new equipment (termed as Shape Separator)
REMARKS/SUGGESTION:	
Recommended with modification.	<ul style="list-style-type: none"> -Project idea is good. -Recommend for a revised total cost of Rs. 45 Lakh with following distribution : Rs. 24.75 lakh (MoM) + Rs. 9 lakh (Industry) + Rs. 11.25 Lakh (CSIR/CSIR-IMMT) -Whiteness analysis can be done from NALCO or other institute. -New Brightness tester should not be purchased -PI has to submit funding letters from industry and CSIR by 15 Dec 2023

38.	
Project No.	SNTMOM/1024/2023
Project Title	Pilot Plant Extraction of Rare Earth Elements (Scandium, Neodymium, and Europium) from KMML Titanium industrial waste
Institution	CSIR National Institute for Interdisciplinary Science and Technology
Principal Investigator	Dr. M. SUNDARARAJAN (08129075511 rajanmsundar77@yahoo.com)
Project Cost & Duration	Rs. 76,91,000.00 (Rs.60.93 lakhs (MoM)+ Rs.15.98 lakh Industry Partner) 2 Years,
Industry /Contribution	Partner Rs. 15.98 lakh
Objectives of the project	Pilot plant extractor for Scandium and other Rare earth elements • TRL level 3 (10 ltr) to 200 ltr continuous process (maximum capacity of 5 gram mixed REE) • Pre treatment of the leach liquor for suitable acid concentration, pH and oxidation / reduction states of select elements. • Solvent extraction separation of scandium values from the leach solution. • Preparation of high purity scandium oxide and its hydro-fluorination to Scandium fluoride. • Calciothermic reduction of scandium fluoride to Scandium oxide
REMARKS/SUGGESTION:	
Recommended modification	with -Project idea is good. -Phase-1 study has been done successfully. -Feasibility study should be done as a part of project deliverables. -Recommended for funding of Rs. 14.93 Lakhs from MoM (for recurring) + Rs. 15.98 lakh from Industry and balance Rs. 46 lakhs from CSIR/CSIR-NIIST towards cost of capital equipment as per guidelines.

39.	
Project No.	SNTMOM/1029/2023
Project Title	Li extraction from Indian grade Li ores
Institution	International Advanced Research Centre for Powder Metallurgy and New Materials
Principal Investigator	Nitin Pandurang Wasekar (9490060079 nitin@arci.res.in)
Project Cost & Duration	Rs.85,56,474.00 (Rs.72,73,003.00 (MoM) + Rs.12,83,471.00 Industry Partner) 3 Years,
Industry /Contribution	Partner Rs. 12,83,471.00

Objectives of the project	(1) To extract Li with more than 97% efficiency from Indian grade ores through combination of pyro metallurgy and hydrometallurgy as per flow diagram presented in detailed methodology (2) To reduce the energy cost in pyro metallurgy treatment through use of mechanochemical activation of Indian grade Li ores (provided by GSI) (3) To use carbonation treatment for roasted solid as an economical and safe way (4) To reduce use of acids and aggressive chemicals to decrease impact on environment (5) To study the role of mechanochemical treatment process parameters, leaching process parameters on extraction efficiency of Li (6) To indigenize the process for Li extraction to help Indian battery making industry for Li ₂ CO ₃
REMARKS/SUGGESTION:	
Not Recommended	<ol style="list-style-type: none"> 1. PI has not carried out any previous work. 2. Resources are yet to be identified. 3. Proof of concept is not done.

40.	
Project No.	SNTMOM/1034/2023
Project Title	Setting up of pilot cum demonstration plant for recovery of alumina and value-added products from fly ash
Institution	CSIR Institute of Minerals and Materials Technology
Principal Investigator	KALI SANJAY (9338291970 ksanjay@immt.res.in)
Project Cost & Duration	Rs.3,92,16,000.00 (Rs.1,96,16,000.00 (MoM) + Rs.1,96,00,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	National Aluminium Company Rs.1,96,00,000.00
Objectives of the project	Validation of Proof of Concept, Generation of engineering data and preparation of Basic Engineering Package (BEP) for setting up of pilot plant (50 kg/day fly ash) at NALCO • Preparation of Detailed Engineering data sheet for bought out equipment and installation of pilot cum demonstration plant (50 kg/day fly ash) and commissioning at NALCO • Pilot plant campaigns including fine-tuning of process parameters for generating data and products • Product evaluation/testing/developing sub-processes for utilizing by-products including recovery of REEs in lab-scale • Technical Feasibility report with viability for processing of fly ash to extract alumina and other valuables.
REMARKS/SUGGESTION:	

Recommended with condition	<ol style="list-style-type: none"> 1. The project deliverables include upgradation of REE including scandium and other material values. 2. PI submitted industry support letter with 50% funding by NALCO. 3. Deliverables should include ATH of metallurgical grade. 4. The pilot-cum-demo plant being set up at NALCO Bhubaneshwar premises and will be used for testing all types of fly ash. 5. Any fine tuning of process to be taken up in the scope. 6. PERC recommended the proposal in anticipation of revision of guidelines.
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41.	
Project No.	SNTMOM/1040/2023
Project Title	Recovery of Battery Grade Lithium Salt from Jammu and Rajasthan Lithium Deposits
Institution	CSIR National Metallurgical Laboratory
Principal Investigator	Abhilash (9431962767 abhilash@nmlindia.org)
Project Cost & Duration	Rs.50,52,600.00 (Rs.48,52,600.00 (MoM) + Rs.2,00,000.00 Industry Partner) 3 Years
Industry Partner /Contribution	CSIR Rs. 2,00,000.00
Objectives of the project	The present research proposal aims to develop the process flowsheet for the preparation of battery-grade lithium salt from potential Indian primary resources of Jammu (Reasi) and Rajasthan (Nagaur) The prime aims and objectives of the present proposal are • Collection of lithium-bearing ores from different possible locations including Reasi, J&K and Nagaur, Rajasthan • Characterization of lithium bearing ores • Mineral processing studies for the enrichment of lithium values • Extraction, Purification, and Separation of 1 kg salt of Lithium (Li ₂ CO ₃ or LiNO ₃ or LiPO ₄)
REMARKS/SUGGESTION:	
Not recommended.	<ol style="list-style-type: none"> 1. PI has not focussed tungsten and lithium together present in the mineral to examine the potential of the proposal. 2. PI advised to carryout ROM (homogenous) sampling in association with GSI for both sites (Rajasthan and Jammu & Kashmir).

42.	
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Project No.	SNTMOM/974/2023
Project Title	Development of eco-friendly soil conditioner for faster waste dump reclamation and agriculture enhancement at mined out area An approach towards bio-waste utilization
Institution	National Institute of Technology Rourkela
Principal Investigator	FALGUNI SARKAR (8986604709 sarkarf@nitrkl.ac.in)
Project Cost & Duration	Rs.53,61,100.00 (Rs.45,01,100.00 (MoM) + Rs.8,60,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.8,60,000.00 (EF polymer private limited, Udaipur)
Objectives of the project	To develop the mine/mineral specific super absorbent polymer variant (SAPV) named as Soil Conditioner using orange, banana , vegetable peels and other plant extracted micro nutrient, after analysing soil/dump material fertility. ii. To utilize soil conditioner to grow plants on the fly ash contaminated dump materials. iii. To assess the effectiveness of using the Soil Conditioner in mine reclamation, particularly for improving soil fertility and water retention capability at dumps and mined-out areas. iv. To evaluate the impact of the Soil Conditioner on vegetation growth and overall ecosystem restoration in reclaimed mining areas. v. To investigate the potential of the Soil Conditioner in reducing the need for synthetic fertilizers and its consequent positive implications for environmental conservation. vi. To analyse the potential cost-effectiveness of using the Soil Conditioner in mine reclamation projects.
REMARKS/SUGGESTION:	
Not-recommended	<ul style="list-style-type: none"> The proposal lacks clarity on field applications. Project proposal is below TRL-3.

43.	
Project No.	SNTMOM/988/2023
Project Title	Carbonaceous Nanomaterials from Graphite Sources of Arunachal Pradesh for Electrochemical Energy Storage and Sensor Applications (Phase II)
Institution	CSIR North East Institute of Science and Technology
Principal Investigator	Manash R Das
Project Cost & Duration	Rs.2,15,78,800.00 (Rs.1,77,14,800.00 (MoM) + Rs.38,64,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.38.64 (CSIR-NEIST)
Objectives of the project	Mining and collection of Graphite samples from Bopi (Kamle district), Tai (Lepa Rada district) and Lalpani (Lohit districts) of Arunachal Pradesh and their characterization (DGM, Arunachal

	Pradesh and CSIR – NEIST) 2. Scale up of synthesis of graphene from the natural graphite sources of Arunachal Pradesh. Scale: 1 kg level batch size of raw graphite sample (Present TRL 3 and Target TRL 6) (CSIR-NEIST) 3. Production of the graphene/silica nanocomposite with variable stoichiometry of silica and carbon content in the natural resources of graphite sample of Arunachal Pradesh (CSIR-NEIST). 4. Evaluation of the electrochemical energy storage properties of the derived graphene based nanomaterials (CSIR-NEIST). 5. Evaluation of sensing properties (colorimetric, fluorescence and electrochemical) of the derived graphene based nanomaterials (CSIR-NEIST). 6. Evaluation of the toxicity of the graphene synthesized from the natural graphite (CSIR-NEIST).
REMARKS/SUGGESTION:	
Not recommended	<ul style="list-style-type: none"> The project proposal lacks clarity. The application of proposed developed material in the field of energy storage and sensor application is not clear.

44.	
Project No.	SNTMOM/990/2023
Project Title	Design and experimental studies of the fiber-reinforced polymer (FRP) solid rock bolts for underground mine support systems
Institution	Indian Institute of Technology ISM Dhanbad
Principal Investigator	Kalyan
Project Cost & Duration	Rs.1,16,38,200.00 (Rs.96,98,500.00 (MOM) + Rs.19,39,700.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.19,39,700.00
Objectives of the project	Design of FRB solid rock bolts as per mine-related standards according to DGMS guidelines. 2. Different types of experimental studies and analysis for tensile tests, compressive tests, 3-point bend tests, and any other testing related to mining support systems. 3. Damage analysis of FRB solid rock bolt after the experimental studies at the microscopic level and correlated with experimental analysis. 4. A microscopic level study will be also carried out to find the microstructure level failures by using the metallurgical microscope and scanning electron microscope.
REMARKS/SUGGESTION:	
Recommended	<ul style="list-style-type: none"> Project idea is good The project deliverables should include a few pull-out test to check the efficacy of rock bolts. The FRB offers alternative, cheaper and better material for reinforcement of underground support system.

45.	
Project No.	SNTMOM/1002/2023
Project Title	Production of Green Hydrogen using Aluminum Dross
Institution	Pandit Deendayal Petroleum University
Principal Investigator	Ramesh Guduru
Project Cost & Duration	Rs.1,19,44,964.00 (Rs.79,44,964.00 (MoM) + Rs.40,00,000.00 Industry Partner) 3 Years,
Industry Partner /Contribution	Rs.40,00,000.00 (Shell Energy India Pvt Ltd)
Objectives of the project	The major objective of this proposal is to develop a full-fledged framework based scheme for large scale effective utilization of dross for production of green hydrogen while recovering other value added products systematically at different stages. To achieve this, the following objectives will be targeted in the project. • To develop a scheme for step-wise separation of constituent phases of dross and recover them separately for value addition • Enhance the availability of free metallic content of aluminum via separation as well as through size refinement for maximum production of hydrogen • Determine the energy consumed and costs incurred at every step based on the process parameters and yields, and determine the economics of the overall scheme • Optimize and enhance the quality control of each step and the overall scheme, and thereby establish an initial frame work for large scale implementation as well as for future collaborations with large scale industries
REMARKS/SUGGESTION:	
Not Recommended	<ul style="list-style-type: none"> • PI has not submitted enough lab data and proof of concept for scalability • PI needs to carry out some more work with respect to quantum of Hydrogen produced per kg of dross.

6. While evaluating the projects of CSIR vis-à-vis mandatory industry participation and CSIR co-funding, the members of the PERC felt that the existing guidelines needs to be revised for better evaluation and output of the projects of CSIR. The PERC accordingly recommended that in case of CSIR Projects, a provision may be added in mandatory requirements of the guidelines that if the contribution from the industry partner is more than 40% of the total cost of the project, the CSIR mandatory co-funding of 25% may not be required.

7. The PERC meeting concluded with vote of thanks to the chair, members and the experts.

**LIST OF PARTICIPANTS OF 23rd PERC MEETING HELD AT JNARDDC, Nagpur on
11th Dec 2023**

1.	Ms Farida M Naik, JS(Mines) - Chairperson (VC)
2.	Shri A.R. Sengupta, Director, IFD (Mines) (VC)
3.	Dr Pradeep Singh , Director (Technical) Mines
4.	Shri R P Gupta, Director (Mines)
5.	Director JNARDDC Nagpur
6.	Director, NFTDC, Hyderabad.
7.	Prof S.P. Mehrotra, IIT, Gandhinagar - (VC)
8.	Dr. B K Satpathy, Ex- Executive Director, NALCO
9.	Dr D Basak, Chief Scientist, CIMFR, Dhanbad
10.	Prof. Santanu Patel , HoD (Mining Eng) IIT, Kharagpur
11.	Prof. S R Samadder, Associate Dean (R&D) IIT-ISM, Dhanbad
12.	Dr D S Rao, Chief Scientist , IMMT Bhubaneswar
13.	Dr Sripad R Naik, HoD (Numerical Modelling) NIRM Bangalore
14.	Mrs Binuta Patra, GGM (R&D) NALCO
15.	Mr Tarak Nath Nayak, GM (Engg. Services) HCL
16.	Mr P P Kulkarni, DGM (E) MECL