Minutes of 16th PERC (Project Evaluation & Review Committee) meeting held under the Chairmanship of Shri Ram Karan, Economic Adviser, Ministry of Mines on 6th September 2017 at JNARDDC, Nagpur. The list of participants is enclosed in Annexure-A.

1. A total of 116 project proposals were receivedfor the year 2017-18. A two-stage review process was adopted to evaluate the proposal for recommendation to SSAG. The first stage comprised of preliminary screening of the proposals done by a team of experts constituted by Ministry of Mines.Based on the guidelines as adopted in 14 PERC, the experts conducted pre-screening of the proposals. 27 proposals covering five areas, namely (i) Geosciences and Exploration (ii) Mining,(iii) Mineral Processing & recovery from waste (iv) Metal Extraction (Metallurgical processes) and (v) Alloys, specialty materials and product were short listed for further review in the second stage.27 project proposals were presented by the respective PIs and evaluated by the committee during the 16thPERC meeting held on 6th September 2017 at JNARDDC, Nagpur. Furthermore one proposal of NIMH recommend by Ministry of Mines was also reviewed.

2. The following criteria were given to all experts for detailed evaluation both from proposal as well as during presentations by the PIs.The evaluation criteria was also communicated by email to all PIs who were called for the presentations.

The evaluation was carried out as per criteria given below:

(i) Is the problem well defined?
(ii) 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
(iii) Does it address a critical gap in our country's needs and requirements?
(iv) Is the methodology of work well laid out and doable?
(v) Are the deliverables well defined ?
(vi) Is there a translational potential for application / user interface; Can it move to higher TRL?
(vii) Does the PI and institution have adequate competence to do the proposed research
(viii) Is there collaboration with another Lab or institution or industry to enhance the quality and quantum and application potential
(ix) Budget: Is the budget correctly done; Is there deficiency or excess
(x) Time duration:
(xi) Any other comments.

The committee experts present in the 16thPERC meeting were divided into three panels with corresponding expertise, namely (a) Exploration and Geo-Sciences & Mining, (b) Mineral processing and Recovery waste and (c) Extraction, Alloys, Products & Specialty Materials. This enabled more time for the PIs to make the presentations as well as detailed interaction. All the three Panels met together at the end and selected the projects for recommendation to the next level SSAG, or asked the PIs to revise and attempt a resubmission to the next PERC or not recommended at all. The details are given in the succeeding paragraphs.

Overall Rating and final recommendation to SSAG

(i) Recommended with or without changes to next level SSAG**(9 Project Proposals)**

(ii) To be revised and resubmitted in next PERC **(6 project Proposals)**

(iii) NOT recommended**(13 Project Proposals)**

3. Based on the detailed review and evaluation, the following **9 (Nine)**Projectproposals comprising of (i) **One** from Geosciences and Exploration (ii) **Two** from Mining (iii) **Two**from Mineral Processing & recovery from waste (iv) **One**from Metal Extraction (Metallurgical processes) and (v) **Three** in the area of Alloys, specialty materials and product are being recommended to SSAG with some revisions.

3.1 One of the important aspects that is emphasized in the revision and made mandatory is to reduce the time duration of the projects in certain cases from 3 years to 2 years with rational reduction in budget outlay. In addition, a few other revisions were suggested which are given specific for each of the recommended projects to be carried out by the PIs/implementing institutions before being considered for SSAG. Out of 9 recommended projects, 5 (five) are from academia, namely (a) IISc, Bangalore, (b) IIT-Kharagpur, (c) Christ University, (d) IIT Bhubaneswarand (e) Saveetha Engineering College, Chennai with emphasis on novel techniques and methods which can have an application potential in near future, if successful. This is keeping in line with the decision of SSAG to fund those projects with a direct application potential while encouraging a few deserving projects in the academic systems as well in a 80-20 paradigm.

3.2 The rest 4 (four)proposals are from R&D laboratories as in JNARDDC, NFTDC and Council on Energy, Environment and Water (CEEW) New Delhi, wherein the emphasis is on quicker development and direct translation to user agency or

commercial exploitation.NFTDC's project is related to the area of Urban Li Battery Mining whereas JNARDDC is collaborating with IIT Bhubaneswar and VNIT, Nagpur in two projects related to industrial wastes. CEEW has been recommended for one project for conducting periodic assessment of resources index of India – for effective policy decisions on mineral and manufacturing sector of India.

4. The details of recommended projects (nine)and specific recommendations are given hereunder.

Category - 1 :Geosciences and Exploration related

4.1 Project ID: 19/ 16PERC /2017-18

Project Title: Critical Mineral (non-fuel) Resources Index of India – for effective policy decisions on mineral and manufacturing sector of India

PI: VaibhavGupta : Email : vaibhav.gupta@ceew.in

Implementing Institution: Council on Energy, Environment and Water (CEEW), New Delhi.

Project Cost : Rs.36.29115 lakh **Duration:**3 years

Objectives :

i. This proposal aims to conduct periodic assessment of critical minerals for the manufacturing economy of India, and intends to apply and advance the already existing framework developed by applicant investigators.

ii. More specific objective is to comprehend current policy decisions (specific to the minerals and manufacturing) into practical scenarios, so as to assist government, industry captains (exploration, mining, mineral processing, and manufacturing), business investors and the research community in having a strategic field of vision.

Remarks and Recommendation:

RECOMMENDED.

a. The project envisages to develop critical index in each mineral commodity in order to access potential of mineral.

b. The country needs to have a periodic estimation of methodology of individual commodities for critical mineral resources available for realistic policy decision.

c. The project will develop a web site which can be viewed in public domain and utilized by Ministry of Mines with common data for assessment.

d. PI advised to keep GSI and IBM on board during the development of framework so that it can be used by these organizations as and when required.

Category 2 : Mining Related

4.2 Project ID: 07/ 16PERC /2017-18

Project Title: Development of a novel underground miningmethod for exploitation of Chromite deposits from friable orebody and host rocks of Sukinda Valley, Odisha

PI: Dr. A. K. Verma, PHD e-mail: akverma@mining.iitkgp.ernet

Implementing Institution: Department of Mining Engineering, IIT, Kharagpur

Project Cost : Rs. 68.46 Lakhs **Duration:** 3 years

Objectives :

Development of Suitable Mining Method Mobile Support System

Remarks and Recommendation:

RECOMMENDED.

a. OMC support letter noted by PERC.
b. The mining / exploration of friable rock mass of horizon are a challenging issue.
c. The project aims in the development of a methodology to address the challenge which is important for conservation of deposits in the country.
d. Odisha Mining Corporation (OMC) has given a letter of support and provided site facility.

4.3 Project ID: 16 / 16 PERC /2017-18

Project Title: Processed Sea sand for construction and other purposes

PI: Sudharson G E mail Sudharson@saveetha.ac.in

Implementing Institution: Civil Engineering Department, Saveetha Engineering College, Saveetha Nagar, Thandalam , Chennai

Project Cost: Rs.51.62 Lakh **Duration:**3 years

Objectives:

i. To develop suitable technique to remove adsorbed ions from dredged marine sand (DMS)
ii. To use the processed sea sand for construction

iii. To compare the characteristics of concrete made with processed and unprocessed DMS
iv. To compare the effectives of water washing with the sintering technique
v. To study the feasibility of river replenishment with the processed sea sand

Remarks and Recommendation:

RECOMMENED with following revisions

a. Budget should be rationalized to **Rs. 40 Lakhs and duration to 2 years**.
b. Usage of offshore sand for construction is a challenging task for the country in near future.
c. The proposal aims for development of suitable technique and use of processed sea sand for construction for cement concrete

Category3 :Mineral Processing & recovery from waste

4.4 Project ID: 01/ 16 PERC /2017-18

Project Title: Estimation of Morphodynamicity and its remedial action using Red-mud based concrete at coastal zone of Eastern Odisha

PI: Mr. MukeshJ.Chadda, (JNARDDC) mukeshchadda1@yahoo.com

And Dr. B.HanumanthaRao, PHD (IIT, Bhubanwswar) Email: bhrao@iitbbs.ac.in

Implementing Institution: Jawaharlal Nehru Alumnium Research Development & Design Centre, Nagpur and Indian Institute of Technology, Bhubaneswar, Odisha

Project Cost: Rs.143.41620 Lakh **Duration:** 3 years

Objectives:

i. Study the key processes of morphodynamicity of coastal zone of odisha (at kendraparha) with the aid of data (viz. wind, wave, tidal current, soil, coastline type) available in the past and present.
ii. Simulate the morphodynamicity using numerical modeling technique in order to critically understand the process and propose site specific suitable remedial measures that most feasible for the study area.
iii. Develop a commercial process for the use of red mud as a raw material for manufacturing of red mud and geopolymer blocks of size 500 mm

Remarks and Recommendation:

RECOMMENDED with following revisions.

a. The projects should be taken up in two parts. The initial feasibility study in Part-A is recommended with a seed money of Rs. 30 Lakhs (JNARDDC: 15 Lakhs & IIT-Bhubaneswar: 15 Lakhs) for a period of 6 months.
b. Based on the results obtained in Part-A, the full scale project may be considered in Part-B
c. The focus of the project should be more on field study.

4.5 Project ID: 05/ 16 PERC /2017-18

Project Title: Nano Processing of Industrial Rejects for Use as Additives in Mix-designs for Improved Pozzolanic Reaction Efficiency

PI: DrPriyankaNayar, E-Mail: priyankanayar_26@yahoo.co.in

DrMangeshMadurwar, E-Mail: mangesh_bits@yahoo.com

Implementing Institution: Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur and Visvesvaraya National Institute of Technology (VNIT) South Ambazari Road, Abhyankar Nagar Nagpur – 440010, Maharashtra (Jointly)

Project Cost: Total: Rs. 49.77170 Lakh **Duration:**2 years

(JNARDDC - Rs. 37.69670 Lakh & VNIT - Rs. 12.07500 Lakh)

Objectives:

i. To utilize the abundantly available industrial wastes; Aluminium industrial waste (Red Mud, Fly Ash), Steel industry waste (Refractory waste, Granulated Blast Furnace Slag, Plant Sludge) in useful manner by making it nano using either top down or bottom up approach and increasing its surface to volume ratio in order to use it for industrial catalytic.
ii. To utilize the abundantly available industrial wastes; Aluminium industrial waste (Red Mud, Fly Ash), Steel industry waste (Refractory waste, Granulated Blast Furnace Slag, Plant Sludge) in useful manner by making it nano using either top down or bottom up approach and increasing its surface to volume ratio in order to use it for industrial catalytic and adsorbent activities.
iii. To process the wastes in such a way so as to enrich any of the three major components and using that enriched residue as precursor to get either individual nano-particles or mixed nano-composites.
iv. To explore suitable applications of these nano-particles/nano-composites as additives in mix design for better pozzolanic reaction and overall reduced use of binding agent to promote the use of industrial wastes / rejects.

Remarks and Recommendation:

RECOMMENED with following revisions

i. The PI has proposed to use a cost-effective way for preparation of nano-particles/nano-composites using industrial wastes as precursors rather than expensivechemicals.
ii. The outcome of the R&D work may lead to overall reduction of construction cost by means of reduced used of binder (cement) which shall be substituted by the above nano-materials which will be cheaper and efficient to improve binding properties.
iii. PI is advised to submit a consent letter from Industry with regards to utilization of the R&D outcome for economic and efficient building and construction work etc.

Category : 4 Metal Extraction (Metallurgical processes) (1 Project)

4.6 Project ID: 6/ 16 PERC /2017-18

Project Title: Urban Li Battery Mining: Physio-Chemical Separation of Used Li ion Batteries for Recovery of Li, Co, Ni active materials and Cu, Al metals

PI:. Dr. B.R.V. Narasimhan PhD. Email: narasimhan@nftdc.res.in

Implementing Institution: Nonferrous Materials Technology Development Centre Kanchanbagh P.O., Hyderabad – 500 058

Project Cost: Total: Rs. 94.82 Lakh **Duration:**2years

MoM - Rs. 83.82 lakh & Central Electronics Ltd (CEL) and NFTDC to support - Rs 11 lakhs

Objectives:

i. Development of pattern recognition based automatic sorting system.
ii. Develop dismantlers (Mechanical Physical methods) for achieving >90% separation components.
iii. Direct separation of cathode, anode and electrolyte.
iv. Chemical Characterization of the product based on properties like conductivity, density, porosity, phase etc meeting Battery Manufacturers.
v. Retreatment of Al and Cu foil for melting into ingots
vi. Extraction of LiPF6 from polymer using DMSO.
vii. Hazardous Waste Management – Preventing toxic metals Co, Ni into environment

Remarks and Recommendation:

RECOMMENDED

1. Project is well conceived and it addresses the issue of Li resource for LiB manufacturing
2. The deliverable is at pilot plant (TRL-7) level and on successful completion technology can be transferred to a large no. of SMEs & MSMEs.
3. Framework for regulatory mechanism for institutionalizing collection and recovery to be examined.

CATEGORY : 5 Alloys, specialty materials and products

4.7 Project ID: 2/ 16 PERC /2017-18

Project Title: Development of Metal-GrapheneAlloys

PI:. Dr. ChandanSrivastava, Email: csrivastava@materials.iisc.ernet.in

Implementing Institution: Department of Materials Engineering, Indian Institute of Science ,Bangalore-560012,

Project Cost: Rs. 21.60 Lakh **Duration:**3 years

Objectives:

i. Development of mechanical milling and electrochemical exfoliation technique based synthesis protocol for producing metal atoms doped and metal cluster decorated graphene.

ii. Controlling the synthesis conditions (mainly mechanical milling parameters and exfoliation potential) to tailor the metal-graphene alloy microstructure with respect to the metal loading (weight fraction of metal to graphene), metal cluster size, metal atom/cluster spatial location on the graphene sheet and defects in the graphene sheet.

iii. Investigation of the magnetic, optical, conducting and electrochemical properties of the metal-graphene alloys with different microstructures.

iv. Systems that will be investigated are: Fe-graphene, Co-graphene. Ni-graphene and multimetal-graphene.

Remarks and Recommendation:

RECOMMENED with following revisions.

1.Application to be made very specific, particularly for graphene conductive electrode materials

2. One dedicated JRF to be taken for the project

3. Institute overheads should be as per SSAG norms i.e. of 1% of capital and 5% of non-capital.

4. Duration to be reduced to **2 years** only

5. Budget to be rationalized within **Rs. 20 lakhs**

4.8 Project ID: 10/ 16 PERC /2017-18

Project Title: Fabrication of Advanced Ceramic Nanocoatings for Automotive Applications

PI:.DrParvatiRamaswamy, PHD, Email: Parvati.ramaswamy@christuniversity.in

JNARDDC, DrPriyankaNayar,, Junior Scientist, Bauxite Department, JNARDDC, Nagpur :E-Mail: priyankanayar_26@yahoo.co.in

Implementing Institution: Christ University, Faculty of Engineering (FECU), (Kengeri Campus), Kanminike, Kumbalgodu P.O Mysore Road, Bengaluru and

And

Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Amravati Road, Wadi, Nagpur-440023 (jointly)

Project Cost: Total: Rs. 43.75920 Lakh **Duration:**3 years

Christ University – Rs. 21.81250 Lakh and JNARDDC- Rs.21.94670 Lakh

Objectives:

i. Use organic binders to prepare micron sized agglomerates of commercially available non-plasma sprayablenano-sized ceramic compositions feed stock materials such as Stabilized Zirconia, Alumina, Alumina –Titania etc.

ii. Use the micron sized spherical agglomerates consisting of nano-structured feed material into a plasma spray equipment to form nano-structured Plasma Spray Coatings on aluminium / aluminium alloy substrates.

iii. Deposition of homogenous alumina nanocoatings on aluminium/aluminium alloy substrates using sol-gel technique

iv. Characterization of the as-synthesized nano-structured coatings for structural phase and microstructure, and very importantly adhesion to the aluminium and its alloy metal substrates.

v. Study the potential of using the above developed fine quality ceramic nano-coatings for certain automotive applications e.g. Zirconia based nano- coatings

for engine components, wear resistant alumina/alumina-titania coatings for wear resistant piston rings etc.

Remarks and Recommendation:

RECOMMENED with following revisions.

i. The PI has relevant expertise and competence in plasma spray related coating technologies.
ii. Applications sectors are well identified, however, specific component to be identified for technology demonstration.
iii. Raw material such as nano YSZ synthesis should also be taken up as supply chain should not affect the project.
iv. Comparison with sol-gel method to be done.
v. Project duration to be reduced to **2 years**.

4.9 Project ID: 12/ 16 PERC /2017-18

Project Title: Value added Electrochemical Devices from Zircon obtained from Beach Sands of Odisha

PI:.DrSoobhankarPati, PhD, Email: spati@iitbbs.ac.in

Implementing Institution: Room 603 A2, School of Minerals, Metallurgical and Materials Engineering, IIT Bhubaneswar, ToshaliBhawan, Satya Nagar, Bhubaneswar, Odisha

Project Cost: Rs. 39.925 Lakh **Duration:** 3 years

Objectives:

i. The primary objective of this work is to synthesize and establish the process conditions for practical utilization of yttriastabilized zirconia (YSZ) obtained from zircon available in beach sands of Odisha. Specifically,
ii. Synthesize yttria stabilized zirconia (YSZ) from beach sands of Odisha
iii. Fabricate two electrocehmical device namely an oxygen sensor and solid oxide fuel cell (SOFC)
iv. Performance evaluation of two electrochemical devices, namely, a SOFC and an oxygen sensor. The devices made will be comparable to the current industry standard

Remarks and Recommendation:

RECOMMENED with following revisions.

1. Project well conceived and it is of high relevance.
2. Interaction with IREL has been established and it is already on.
3. PI has done significant prior work.
4. Project will have good impact value on successful completion.
5. Duration to be reduced to **2 years** only.

5.0 Projects NOT recommended or to be resubmitted to next PERC

The following 19 project proposals have not been recommended.Out of these 19, **SIX** proposals are given another opportunity to **resubmit to next PERC** with revisions.In these 19 proposals, one or more of the following have been observed: (i) objectives are very sketchy and methodology not clear or doable; (ii) proposals not directly in the thrust areas, (iii) outcomes are not relevant or impactful, (iv) there is no visible translational potential; (v) similar projects have already been funded, (vi) it could be directly done as a consultancy project with the industry; (vii) preliminary proof of concept is not done; (viii) the proposed work can be done by PI within the facilities available with them and it does not really need a project proposal;(ix) in a few casesPI has not adequate domain knowledge in mining or minerals or lacking a partner with domain knowledge, (x) casual approach to problem definition and a loose connection made between mining, minerals and waste.

The list of 6 (six) projects to be resubmitted with revision to PERC is as below:-

5.1 Project ID: 04/ 16 PERC /2017-18

Project Title: Design and development of new approaches for recovering and removing copper from mine tailings

PI: Dr. Vipin Kumar, PHD Email: vipinmicro1@gmail.com

Implementing Institution: Dept. of Environmental Science and Engineering, IIT (ISM), Dhanbad – 826 004, Jharkhand

Project Cost: Rs. 31.57800 Lakh **Duration:** 3 years

Objectives:

i. To measure the concentration of heavy metals including copper in and around selected mine sites of varying distance and depth.

ii. To optimize the biomass of indigenous plant species and examine the Cu accumulation of selected plant species.
iii. To Design the economic bio-reactor for mineral leaching and metal recovery from mine tailings.
iv. To determine the optimal field conditions and limiting factors for the copper phytomining.

Remarks and Recommendation:

To be RESUBMITTED with consent and financial support letter from HCL.

5.2 Project ID: 18/ 16 PERC /2017-18

Project Title: Treated Ferromanganese Slag as an Adsorbent Media for Arsenic and Fluoride Ions from Water.

PI: Dr. Abhijit Maiti, mabhifpt@iitr.ac.in, abhijit14675@gmail.com

Implementing Institution: Polymer & Process Engineering Department, IIT Roorkee, Saharanpur Campus, Saharanpur-247001, UP, India

Project Cost: Rs. 47.104 Lakh **Duration:** 3 years

Objectives:

i. To treat the ferromanganese slag and make it useful oxidant for harmful arsenate ions and subsequently use as an adsorbent for different ions from water.
ii. To develop the commercial water filter by using the treated slag to remove arsenic and other ions removal from contaminated groundwater and arsenic contaminated mining wastewater

Remarks and Recommendation:

To be **RESUBMITTED** with following revisions.

i. After identifying specific mine and submitting consent letter from the mine.
ii. The revised proposal should also contain proof of the concept proposed at Lab scale using batch scale test.

5.3 Project ID: 3/ 16 PERC /2017-18

Project Title: High Performance rare Earth metal as Electrode material for Supercapacitor applications and fuel cells

PI:. Dr.V.Sindhu, PHD, Email: sindhusrini@gmail.com

Implementing Institution: Department of Physics, VelammalInstitue of Technology Pancheti, Chennai,Tamil Nadu

Project Cost: Rs. 29.54945 Lakh **Duration:**3 years

Objectives:

i. To synthesize thin layer of Rare earth oxide/polymer thin film
ii. To synthesize the composites of cerium, Terbium rare earth oxides with transition metals and conducting polymers.
iii. To characterize the synthesized films using optical studies using U-Vis spectrometer, Photo luminance, Photocatlytic activity.
iv. To investigate their optical, electrochemical, morphological and photovoltaic properties using U-Vis spectrometer, Photo luminance, SEM,TEM, TGA, XRD, FTIR, RAMAN,
v. To analyze the effect of rare earth oxide/polymer nanomaterial on Supercapacitors and fuelcells.

Remarks and Recommendation:

To be RESUBMITTED with following revisions.

1. Materials optimisation and specific application from material to electrodes for supercapacitor should be focused.
2. The estimate for capital equipment seems low for the intended equipment(s)
3. Duration to be reduced to **2 years**
4. JRF (dedicated) should be complimentary in discipline (eg. Electrochemistry) to the PI.

5.4 Project ID: 13/ 16 PERC /2017-18

Project Title: Development of Novel Cr-Free Nickel Based Metal Alloy as Filler Materials for Welding Stainless Steel

PI:. Dr. J. R. Nataraj, PhD, Email:natarajjr@rvce.edu.in

Implementing Institution: Mechanical Department, R. V. College of Engineering Bengaluru-560 059

Project Cost: Rs. 42.924 Lakh **Duration:**3 years

Objectives:

i. To Develop Cr-free nickel based metal alloy as filler materials for welding stainless steel

ii. To generate phase diagrams for developed alloys
iii. To optimize the chemical composition of the Cr-free nickel based alloy based on phase diagram, mechanical properties and corrosion resistance.
iv. To characterize the weld joints (Base metal stainless steel) for mechanical and corrosion properties.

Remarks and Recommendation:

To be RESUBMITTED with following revisions.

1. Project objections are at present at academic interest levels.
2. Utility of the project is very limited.
3. PI should reorient towards cost effective Fe-based and low Cr filler materials and also project should demonstrate material- porous product development chain in a systematic approach.
4. Budget should be rationalized to **less than Rs. 30 lakhs**.
5. Project time should be reduced to **2 years**

5.5 Project ID: 20/ 16 PERC /2017-18

Project Title: Development of open cell aluminium foams for heat sink and EMI Shielding Applications

PI:. Dr. D. P. Mondal, PHD, Email :mondaldp@yahoo.com, dpmondal@ampri.res.in

Implementing Institution: CSIR-Advanced Materials and Processes Research Institute (CSIR-AMPRI)

Project Cost: Rs. 47.38 Lakh **Duration:**2 years

Objectives:

i. Development of a process for open cell aluminum foam with uniform and finer cell size.
ii. Design of aluminium foam with most effective heat transfer through finite element simulation.
iii. To develop open cell foams with different densities, cell size.
iv. Effect of cell size, densities on thermal conductivity, specific heat, heat extraction coefficient, specific surface area.
v. Effect of graphene addition on thermal conductivity of the foams
vi. Effect of cenosphere and red mud addition on the elctro-magnetic shielding of aluminium foam
vii. Component design, fabrication and performance evaluation.

Remarks and Recommendation:

To be RESUBMITTED.

i. Project focus to be more product oriented and with product attributes as target.
ii. Two specific applications for product should be taken up.
iii. Software is not critical for the project deliverables and can be dropped.
iv. Institute overhead should be as per SSAG norms.
v. Duration to be **2 years** and overall budget to be reduced to **Rs. 30 lakhs**
vi. CSIR to contribute atleast 30% of funding

5.6 Project ID: 25/ 16 PERC /2017-18

Project Title: Rare-earth free intermetallic compounds to develop a new generation of high-performance Permanent Magnets.

PI:. 1. Dr. M Vasundhara, Ph.D, E-mail: mvas@niist.res.in, vasu.mutta@gmail.com;
2. Dr. Ajit Kumar Patra, PhD, Email:phyakp@gmail.com,a.patra@curaj.ac.in

Implementing Institution: 1. Material Science and Technology Division, CSIR-National Institute for Interdisciplinary science and Technology (CSIR-NIIST), Industrial Estate P.O, Trivandrum 695019

And 2. Department of Physics, Central University of Rajasthan, NH-8, Bandar Sindri, Dist-Ajmer
Rajasthan-305801 (joint)

Project Cost: Total: Rs. 60.2852 Lakh **Duration:**3 years

Objectives:

i. The aim of the project is to investigate the effect of composition, doping, preparation routes (induction melted followed by rapidly quenching bulk samples, chemically synthesized nanomaterials& epitaxial thin films), preparation conditions and post annealing temperature on the structural and magnetic properties of the MnX (X = Al, Bi and Ga) alloys to have a better understanding on the underlying physics and optimize the magnetic properties (high magnetic anisotropy, high Curie temperature and large coercivity) for requisite applications.
ii. An investigation of the structural and magnetic properties of these MnX compounds at the nano-scale i.e., chemically synthesized nanoparticles, nanostructured ribbons and 2D thin films will be carried out.

iii. To develop soft magnetic phases viz. Fe,Co and FeCo via chemical routes.

iv. The focus will be to exploit the hard magnetic phases of Mn-X in combination with the controlled microstructure for hard magnetic applications with the eventual goal of integrating these phenomena in thin film vertical heterostructures with complex, magnetically coupled exchange media.

v. To design and develop the exchange spring magnet compositions with hard magnetic phases of Mn-X nanoparticles along with soft magnetic phases Fe,Co and FeCo. The design of the exchange spring magnets by microstructure engineering will be optimized to get maximum properties. Hence this project aims at developing RE-free permanent magnets of energy product of at least 12 MGOe by above said methods.

vi. Development of magnetic nano composites with energy product of at least 12 MGOe, their synthesis and secondary processing methodology and magnet making procedures at lab scale so that industries can scale up.

Remarks and Recommendation:

Project to be RESUBMITTED with following revisions.

1. The project is at present at conception level
2. Scalability potential of magnet making is not seen in the flowsheet
3. The project should be revised significantly in terms of budget and its partition
4. CSIR to contribute atleast 30% of funding
5. Institute overheads should be as per SSAG norms

6.0 The list of 13 (thirteen) projects NOT RECOMMENDED is as below:-

6.1 Project ID: 08 / 16PERC /2017-18

Project Title: National reserve estimation for critical minerals of Indium, Gallium, and Selenium using geochemical investigation of mine wastes and tailings of major host minerals, statistical consistency analysis and estimation

PI: Professor Triloknath Singh, PHD, Email: tnsingh@iitb.ac.in

Implementing Institution: Department of Earth Sciences, Indian Institute of Technology Bombay

Project Cost : Rs. 50.18 Lakh **Duration:** 3 years

Objectives :

i. To prepare a comprehensive geochemical profile of the mine wastes and tailings and host mineral ores for each zone of geological zone in the country for In, Ga and Se.
ii. Establishing a statistical linkage betweenthe geochemical data and the critical mineral percentages and finding regression equations and other statistical toolboxes to give required relations.
iii. Predicting critical metal reserves and projecting them to nation-wide scale based on the geological zones and finally estimating the total reserve and reserve map.

Remarks and Recommendation:

NOT RECOMMENDED.

a. PI has not identified the sites.
b. Subsequent work plan is theoretical without background study of these strategic elements.
c. Objective of creation of national resource/reserve map is not justifiable

6.2 Project ID: 14 / 16PERC /2017-18

Project Title: Development of innovative support system for possibility of extraction of locked ore after open pit mining

PI: DrVishwas A Sawant, PhD : Email: sahoofce@iitr.ac.in jpscivil@gmail.com

Implementing Institution: Department of Civil Engineering Indian Institute of Technology Roorkee

Project Cost: Rs. 28.989Lakh **Duration:** 3 years

Objectives:

i. It is proposed to suggest methodology to extract locked ore.
ii. It is proposed to try for vertical extraction of ore by providing support system from surrounding.
iii. To provide design of support system with respect to depth of extraction of ore.

Remarks and Recommendation:

NOT RECOMMENDED.

a. PI need to seek support from working mine as objective is based on specific rock mass characteristics.

b. General solutions and the project activities proposed do not appear to be feasible from the project methodology.
c. Without a specific method of mining and rock mass, the outcome is not justified.

6.3 Project ID: 15 / 16 PERC /2017-18

Project Title: Prediction of dust levels in and around the open cast mines by dispersion modeling

PI: Dr. Vilas Warudkar, PhD : Email: vilas_warudkar@rediffmail.com, vilaswarudkar@gmail.com

Implementing Institution: Department of Mechanical Engineering Maulana Azad National Institute of Technology, Bhopal

Project Cost: Rs 63.425 Lakh **Duration:** 3 years

Objectives:

i. Evaluation of source term for open cast uranium mining activities.
ii. Estimation of emission factors for different dust generating operations from different activities like drilling, blasting etc. in open cast mines of uranium ore.
iii. Using the emission source term, prediction of dust levels in and around the open cast mines by dispersion modeling.
iv. Collections of metrological data at open cast uranium mine site: wind speed, wind direction, temperature and humidity.
v. Dust monitoring at different locations in and around open cast uranium mines in three seasons using High Volume Dust Sampler.
vi. Development of computer program for the calculation of dust concentration.
vii. Chemical characterization of dust sample and soil samples collected from different location.

Remarks and Recommendation:

NOT RECOMMENDED.

a. PI needs to seek support from specific open cast mines of reasonable output.
b. The project envisages general outcome covering diverse measures of rock types which is not justifiable.
c. Standard softwares are already available for monitoring the dust around mines.

6.4 Project ID: 09/ 16 PERC /2017-18

Project Title: Bio-Electro-Fenton Microbial Fuel Cell (BEF-MFC) for Mining Industry Wastewater Treatment

PI: Dr. Manoj Kumar Nayak, Email: mknayak@csio.res.in

Implementing Institution: Materials Research Division, Agrionics CSIR-Central Scientific Instruments Organisation, Sector 30-C, Chandigarh Chandigarh 160 030, India

Project Cost: Total: Rs. 68.52 Lakh **Duration:**3 years

Objectives:

i. The fabrication of an integrated MFC-EF (Bio electro Fenton Cell -BEF) for wastewater treatment
ii. Synthesis of various anode/ cathode electrode materials to investigate the efficiency ofϖ BEF in terms of removal of heavy metals and degradation of organic pollutants present in wastewater.
iii. The efforts for the simultaneous removal of heavy metals and organic pollutants usingϖ BEF
iv. The feasibility to employ the developed BEF to treat wastewater at commercial scaleϖ from economical viewpoint.

Remarks and Recommendation:

NOT RECOMMENDED

i. Lack of specific objectives.
ii. Already lot of work has been done in this area.

6.5 Project ID: 11/ 16 PERC /2017-18

Project Title: Development of Indigenous and Environmental Friendly Materials and Process for Recovery of Gallium from Mine Wastes and By-products

PI: Dr. AmitBansiwal, Email: ak_bansiwal@neeri.res.in

Implementing Institution: Environmental Materials Division CSIR - National Environmental Engineering Research Institute (CSIR-NEERI) Nehru Marg, Nagpur-440020

Project Cost: Rs. 54.28880 Lakh **Duration:** 3 years

Objectives:

The main objective of the proposed project is to develop process for efficient recovery of gallium from Bayer Liquid based on indigenous materials and overcoming limitations of existing processes.

Remarks and Recommendation:

NOT RECOMMENDED

i. Techno-economics feasibility not explained properly.
ii. Technology for recovery of Ga already exists.

6.6 Project ID: 17/ 16 PERC /2017-18

Project Title: Recovery of pyrites and valuable metals from plant tailings of copper mines

PI: Dr. Kamalesh K. Singh, Email: kksingh.met@iitbhu.ac.in

Implementing Institution: Department of Metallurgical Engineering, Indian Institute of Technology, Banaras Hindu University, Varanasi, India

Project Cost: Rs. 43.92 Lakh **Duration:** 3 years

Objectives:

i. Neutralization of acidic water by suitable minerals /chemicals/ materials to control or reduce the acidity of tailings dams as well as mitigation of acidity of tailing pond by removal/recovery of pyrite before disposal into tailing pond.
ii. Recovery of valuable metallic values from spigot.

Remarks and Recommendation:

NOT RECOMMENDED

i. No reasonable estimate made by PI about the pyrites and other value in the plant tailings.
ii. Theoretical in nature, very poorly conceived and low impact.
iii. Economically unviable.

6.7 Project ID: 21/ 16 PERC /2017-18

Project Title: Recovery of Rare Earth Elements from coal mining

PI: Dr. S. Srinath, PHD, Email Id: srinathnit@gmail.com, srinath@nitw.ac.in

Implementing Institution: Department of Chemical Engineering, National Institute of Technology Warangal, Telangana, India-506004. Centre for Environment, Institute of Science and Technology, Jawaharlal Nehru Technological University Hyderabad, Kukatpally, Hyderabad-500085. Telangana, India

Project Cost: Rs. 39.94400 Lakh **Duration:** 3 years

Objectives:

i. Identification and Recovery of Rare earth elements from coal mine waste.
ii. Acid Leaching for recovery of rare earth elements using HCl/, H2SO4/HNO3. Followed by Precipitation of rare earth elements using oxalic acid/ ammonium bicarbonate and sodium sulphate/ application of Ion exchange technique for the recovery of rare earth elements using ammonium sulphate and sodium chloride.
iii. Ultrasound assisted extraction of rare earth elements

Remarks and Recommendation:

NOT RECOMMENDED

i. Objectives not well defined.
ii. The mines where the project can be taken up has not been identified.

6.8 Project ID: 22/ 16 PERC /2017-18

Project Title: Extraction of Copper and Precious metal from E-waste/Urban Ore

PI: Dr. T.K.Bandyopadhyay, PhD, Email: tbanerjee@metal.iitkgp.ernet.in

Implementing Institution: Assistant Professor, Department of Metallurgical and Materials Engineering, Indian Institute of Technology Kharagpur, Kharagpur-721302

Project Cost: Rs. 78.72 Lakh **Duration:** 3 years

Objectives:

i. To analyze amount of copper and precious metal content in PCBs
ii. To recover copper from PCB using leaching agent like NH3 and also (NH4)2SO4.
iii. To study the effect of various process parameter like particle size, stirring, temperature on recovery rate.
iv. To optimize the process parameters
v. To recover copper and other metal value from leaching solution using electrometallurgical process

Remarks and Recommendation:

NOT RECOMMENDED.

PI was ABSENT.

6.9 Project ID: 23/ 16 PERC /2017-18

Project Title: Recovery of Rare Earth Elements from waste of Coal Mines: Best from the waste

PI: Dr. RashmiMadhuri, PhD, Email: rshmmadhuri@gmail.com; madhuri.r.ac@ismdhanbad.ac.in

Implementing Institution: Department of Applied Chemistry, Indian Institute of Technology (Indian School of Mines), Dhanbad Jharkhand-826 004,

Project Cost: Rs. 79 Lakh **Duration:** 3 years

Objectives:

i. The project's ultimate goal is to develop, design and test a mobile pilot scale facility with capacity to recover REEs from coal waste and/or coal byproducts.
ii. Pre-concentration of the analytes to a level above the limit of detection of the analytical instrument, so that identification of REEs in coal waste could be done.
iii. Isolation of the analytes from the original sample matrix and/ or matrix simplification and Removal of interferences from the collected sample constituents.
iv. For this, design and synthesis of new responsive functional monomers will be done, which can provide a wide range of options. With the smart design and synthesis of new functional monomers according to magnetic response modes, the selectivity of responsive-MIPs will be significantly improved, and a variety of analytes (i.e. various REEs) will be imprinted.
v. Validation of proposed system with standard methods and other commercially available extraction units.
vi. Real sample analysis of coal waste using proposed qualitative and quantitative devices for REEs.
vii. To develop a green, clean and economic device for recycling or extraction of REEs in comparison to the more cost competitive and conventional generation sources.

Remarks and Recommendation:

NOT RECOMMENDED.

i. The proposal does not identify the REEs to be recovered.
ii. Test tube scale methodology unlikely to work in this case.
iii. PI is unaware of the present status and advancements in the world in this area.

6.10 Project ID: 24/ 16 PERC /2017-18

Project Title: Transforming Mine Sludge Waste to Value Added Materials for Application in Water and Wastewater Treatment

PI: Dr. Manoj Kumar Tiwari, PhD, E-mail ID: mktiwari@swr.iitkgp.ernet.in

Implementing Institution: School of Water Resources, Indian Institute of Technology Kharagpur

Project Cost: Rs. 49.46 Lakh **Duration:** 3 years

Objectives:

i. To process mine waste sludge for producing low-cost adsorbent for water filtration.
ii. To explore bio-stimulant properties of processed mine sludge for its application in the biological wastewater treatment process.
iii. To analyze the potential of developed system for the degradation of specific and emerging contaminants.
iv. To optimize sludge processing, and treatment procedure and parameters for cost-effective and efficient output.
v. To conduct a cost-benefit analysis and life cycle assessment of mine sludge being used for contaminant removal.

.

Remarks and Recommendation:

NOT RECOMMENDED

i. Very generalized proposal.
ii. Repetitive nature of work.

6.11 Project ID: 26/ 16 PERC /2017-18

Project Title: Beneficiation Studies on Indian Low Grade, Friable Chromite Ore and Mine Waste Dump Samples

PI: Dr. Rajendra Kumar Rath, PhD, Email: rkrath@nmlindia.org.

Implementing Institution: Mineral Processing Division, CSIR-NML, Jamshedpur-831007, Jharkhand

Project Cost: Rs. 428.3 Lakh **Duration:** 3 years

Objectives:

Development of process technology for beneficiation of low grade friable chromite ore and mine waste dump samples.

Remarks and Recommendation:

NOT RECOMMENDED.

i. Techno-economic analysis not worked out.

ii. Financial support from CSIR is required.

6.12 Project ID: 27/ 16 PERC /2017-18

Project Title: Study on optimization and improvement of mineral beneficiation plant performance through modeling and simulation

PI:. M/s Ajit Kumar Swain, Email: akswain@nmlindia.org

Implementing Institution: Mineral Processing Division, National Metallurgical Laboratory, Burmanines, Jamshedpur

Project Cost: Rs. 240.175 Lakh **Duration:** 3 years

Objectives:

i. To develop pilot scale model for mineral processing unit operation circuit (crushing, grinding, classification, flotation, gravity separation).
ii. To improve beneficiation plant performance..

Remarks and Recommendation:

NOT RECOMMENDED

i. There is no translational potential for application
ii. Objectives defined are very general in nature
iii. Lot of work has already been carried out in this area.

6.13 Project ID: 28/ 16 PERC /2017-18

Project Title: Health surveillance &respireable dust survey of mine workers from various mining sectors, (Reconsidered as discussed in the 47th SSAG held on 23.8.2016):

Project Cost: Rs. 195 Lakh : Duration : 2 years.

Implementing Institution: National Institute of Miners Health, Nagpur. (NIMH)

PI:. Dr. Sarang Dhatrak

Remarks and Recommendation:

NOT RECOMMENDED

1. The project should have a consent from DGMS
2. Similar kind of work is already been done with limited staff at NIMH

7.1 Agenda item nos. 2 : Review of ongoing projects for considering draft final report.

The PERC members opined that the final review of the project "Development of real time instrument / system to measure bath ratio, alumina concentration, bath temperature and superheat of the Aluminium Electrolysis bath" was already carried out in the last review meeting held at NFTDC, Hyderabad on 18-19th May 2017. The project is already completed and draft report is submitted in April 2017.

8.0 Other items :

8.1 JNARDDC may be asked to submit a complete proposal to Ministry of Mines on the status paper on the work carried out nationally and internationally on red mud to benchmark future investigation in the country for Rs. 25 Lakhs.

8.2 A workshop needs to be held to deliberate on the research and investigation that needs to be carried out in the mining and minerals and metallurgy sector. NALCO may be asked to organize such a workshop inviting experts from HCL, HZL, NALCO, BALCO, HINDALCO, IBM including Ore dressing lab, VEDANTA, GSI etc . JNARDDC and NFTDC in consultation with NALCO and Ministry of Mines will assist in organizing the workshop.

The PERC meeting concluded with thanks to the chair and the experts.

LIST OF PARTICIPANTS OF 16TH PERC MEETING HELD AT JNARDDC, NAGPUR

Sr no	Name	Portfolio
1.	Shri Ram Karan Economic Adviser (Mines), New Delhi	Chairman
2.	Dr.K.Balasubramanian Director, NFTDC Hyderabad	Member
3.	Prof. T.C. Rao Ex. Director, RRL Bhopal	Member
4.	Dr. A. Agnihotri Director, JNARDDC & Director, NIMH (Addl. Charge)	Member
5.	Shri Rajendra Singh Chief Scientist & Head, CIMFR, Dhanbad	Representative Member
6.	Prof. A.K. Singh HoD& RGCP, ISM, Dhanbad	Representative Member
7.	Shri Subrat Kar GM (R&D), NALCO	Representative Member
8.	R.N. Jha Director (Technical), MECL, Nagpur	Representative Member
9.	C K Thoolkar MECL, Nagpur	Representative Member
10.	Shri A.K. Mallik Under Secretary (Mines), New Delhi	Ministry of Mines Incharge of Met.IV Section
11.	Dr. J. Bagchi Director (Technical) , Mines, New Delhi	Member Secretary