

## **Minutes of the 46<sup>th</sup> Meeting of Standing Scientific Advisory Group (SSAG) held on 2<sup>nd</sup> December 2015 at 11.30 A.M in Room No.320, “A” Wing, Shastri Bhavan, New Delhi**

Secretary, Ministry of Mines and chairperson, SSAG welcomed the members to the 46<sup>th</sup> SSAG meeting. He mentioned that SSAG plays an important role in fostering R & D projects in mining, minerals and materials sector and in this meeting a significant number of projects are being considered based on the review and recommendations of the Project Evaluation and Review Committee (PERC).

Shri Sudhakar Shukla, chairperson, PERC made a brief presentation on three stage review process of the project proposals conducted by PERC. He observed that in the last call, eighty six proposals were received from 38 institutions comprising of (a) eight laboratories, (b) ten academic institutions including ISM, IITs, NITs, IISER (c) nine universities, both private and government, (d) twelve colleges and (e) one government department. The 86 project proposals were received from these 38 institutions. He added that distribution of institutions show a range of organizations which illustrates a good exposure of S & T scheme of SSAG in academia, laboratory and industry.

Out of 35 proposals that were considered for third stage review, Chairman PERC informed that ten projects were finally short listed for recommendation in this SSAG meeting for consideration. These ten proposals are distributed under different areas of thrust and have been accordingly categorised. Dr. Brakaspathy from Dept of Science and Technology enquired whether only applied research projects are being funded by the SSAG. It was clarified that the emphasis is more on TRL 3 and above levels of technology oriented R & D with a potential for translational R & D. If basic research is also to be considered for funding, DST and other funding agencies shall also be involved in the overall funding of the project.

The ten project proposals placed in agenda item I as recommended by PERC were individually taken up for discussion by the SSAG members. Unique project IDs are given for enabling future reference and review.

### **Category - I: Exploration and Geosciences**

In the area of exploration and geosciences, the following two projects were short listed by PERC.

#### **Project ID : 01/46SSAG/CAT-1**

Agenda Item: 1.10

Mineralogical and geochemical characterization of Indian Glauconites for alternative potassium fertilizers, Indian Institute of Technology, Bombay and NGRI, Hyderabad.

Total cost: Rs. 55 lakh (recommended by PERC), duration - 3 years  
To be equally distributed to IIT, Bombay and NGRI, Hyderabad

| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
|-----------------|-----------------------------|-----------------------------|
| Rs. 25 lakh     | Rs. 15 lakh                 | Rs. 15 lakh                 |

#### **Project ID : 02/46SSAG/CAT-1**

Agenda Item: 1.9

Rare earth mineral concentration in the beach sands of Uttara Kannada coast: their economic viabilities and sustainable mining, SDM College of Engineering and Technology, Dhavalagiri, Dharwad.

Total cost: Rs. 29.44 lakh (recommended by PERC), duration - 3 years

|                   |                             |                             |
|-------------------|-----------------------------|-----------------------------|
| Ist Installment   | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
| Rs. 18.20560 lakh | Rs. 5.28960 lakh            | Rs. 5.94480 lakh            |

## Category - 2: Mining & Related Domains

SSAG took cognizance of the fact that largest number of projects, viz 22 were reviewed in Stage-3 in this category of mining related domains. These projects covered mine planning, rock mechanics, mining machinery, mine waste treatment and miners health. During the review by PERC, it was noticed that quite a few project proposals fall more in the realm of consultancy with less research and development content. In addition, it was also pointed by PERC chairman and the SSAG members serving in PERC, that many projects pertaining to mine waste management, mine safety such as sensors, distant monitoring have been arrived at without any interaction with mining companies. PERC had given the feedback to the PIs at the time of review itself to define the problem better and also have mining companies as partners for enhancing the probability of demonstration and field application. It is worthwhile to put out these desirable requirements in the website along with the call for proposals in the future. In view of the above, four projects were recommended for revision and resubmission in the next PERC meeting and they would be subsequently taken up on their merit. The following four projects were short listed and recommended by PERC for funding in this SSAG.

### Project ID : 03 /46SSAG/CAT-2

Agenda Item: 1.2

Simulation of simultaneous rock fractures at multiple scales, Birla Institute of Technology and Science, Pilani

This project deals with modeling and simulation with a view to obtain optimum fracture of rocks and validation of it in lab experiments. The problem definition and methodology were well laid out. The project outcome which is an expert software system has a potential for direct application.

Total cost: Rs. 30 lakh (recommended by PERC), duration - 3 years

|                 |                             |                             |
|-----------------|-----------------------------|-----------------------------|
| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
| Rs. 13.30 lakh  | Rs. 8.35 lakh               | Rs. 8.35 lakh               |

### Project ID : 04/46SSAG/CAT-2

Agenda Item 1.6

Assessment and prediction of land surface deformation due to underground metal mining in northern Aravali range of hills using microwave remote sensing data sets and ground based observations, Indian School of Mines, Dhanbad

Total cost : Rs. 45 lakh (recommended by PERC)

Duration - 3 years

|                 |                             |                             |
|-----------------|-----------------------------|-----------------------------|
| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
| Rs. 25.6 lakh   | Rs. 9.7 lakh                | Rs. 9.7 lakh                |

Land surface deformation due to underground mining is of relevance and an impactful work is being envisaged in this project within a conservative budget. ISM Dhanbad has significant amount of experience and facilities which are being leveraged for practical application.

### Project ID : 05/46SSAG/CAT-2

Agenda Item 1.7

Study the feasibility of treatment of seepage waster from chromite mine quarries of Odisha, National Institute of Technology, Rourkela.

Total cost: Rs. 32 lakh (recommended by PERC) ), duration - 3 years

|                 |                             |                             |
|-----------------|-----------------------------|-----------------------------|
| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
| Rs. 16.00 lakh  | Rs. 8.00 lakh               | Rs. 8.00 lakh               |

Regarding this proposal, PERC noted that PI had done the necessary preliminary work and then submitted this proposal for a more detailed study. The problem definition, methodology are well elucidated and the site selection is also done for demonstration. This project would have good impact if it is successfully demonstrated as envisaged in the deliverables.

**Project ID : 06/46SSAG/CAT-2**

Agenda Item 1.3

Development of standard protocol of field audiometry for notifying noise induced hearing loss, National Institute of Miners' Health, Nagpur.

Total cost: Rs. 40 lakh (recommended by PERC) ), duration - 3 years

|                 |                             |                             |
|-----------------|-----------------------------|-----------------------------|
| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
| Rs. 23.60 lakh  | Rs. 8.20 lakh               | Rs. 8.20 lakh               |

NIMH has been engaged in studying dust, noise related issues that can have adverse effect for the occupational work force. In this regard, their work is aimed at early detection and preventive measures. In order to prevent the noise induced hearing loss, it is necessary to evolve and fix standard protocols for measurement as well as intervention with appropriate safety and protective gears. This project aims at coming out with such standards and it is timely and appropriate.

**Category - 3: Ore Dressing, Beneficiation and Mineral waste processing**

It was pointed out by chairman and members that it is necessary to look at ways and means to increase recoveries, investigate lean ores for economic values through R & D, explore multi - metal extractions and also address mitigation methods for environmental protection. In addition, it is worthwhile to consider development of process flow sheets for developing products of value from mineral waste materials. SSAG noted that the recommended projects do address these thrust areas. The following three shortlisted proposals in the area of mineral beneficiation and mineral waste processing were taken up for discussions.

**Project ID : 07/46SSAG/CAT-3**

Agenda Item: 1.1

Enhanced recovery of manganese as electrolytic manganese dioxide (EMD) from ferro manganese mine tailings through bioleaching, Siksha O Anusandhan University.

Total cost: Rs. 30 lakh (as recommended by PERC), duration - 3 years

|                 |                             |                             |
|-----------------|-----------------------------|-----------------------------|
| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
| Rs. 16.60 lakh  | Rs. 6.70 lakh               | Rs. 6.70 lakh               |

Tailings have always been seen as economically unviable and are stored as large dumps for long periods. Tailings are to addressed from both environmental and economic perspective This project aims at recovery of manganese through bio leaching techniques. The problem definition and solution methodology have a clarity and purpose. The budget is limited and the project is

doable. Keeping the overall budget same, the project duration can be reduced to two years to enable practical realization of the outcomes at an earlier date.

**Project ID : 08/46SSAG/CAT-3**

Agenda Item: 1.4

Synergistic utilization of aluminium industrial wastes for development of geopolymeric building materials, Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur and Swarnalata Holdings, Raipur (Jointly)

Total cost: Rs. 40 lakh, duration - 3 years

| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
|-----------------|-----------------------------|-----------------------------|
| Rs. 13 lakh     | Rs. 21 lakh                 | Rs. 6 lakh                  |

Utilization of waste from aluminium industrial operations and value addition have been given the thrust in this project. JNARRDC has done the preliminary work for proof of concept in this area and this project envisages to carry the work further towards developing building materials as products from waste. In order to enable scale up and commercialization, an industrial partner has also been identified and nearly 30% co funding has also been incorporated. SSAG members appreciated the waste to value as well as the lab to commercialization effort envisaged in this project. Chairperson advised JNARRDC to obtain IP assets and also enter in to MOU for enabling any future royalty proceeds.

**Project ID : 09/46SSAG/CAT-3**

Agenda Item: 1.8

Recyclability strategy or value-added utilization of iron/manganese ore tailing/ low grade ore: evaluation of energy storage capacities, Institute of Minerals and Materials Technology, Bhubaneswar.

Total cost: Rs. 35 lakh (recommended by PERC), duration - 3 years

| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
|-----------------|-----------------------------|-----------------------------|
| Rs. 25 lakh     | Rs. 5 lakh                  | Rs. 5 lakh                  |

This project aims at development of process flow sheet for handling manganese and iron contents in tailings and other wastes to obtain higher purity mixed oxides that can become potential source for die-electric and other energy storage materials. While the project proposal per se is doable in lab scale, PERC as well as SSAG observed that the deliverables of the project should include scale up and validation with actual product prototype development and demonstration.

**Category - 4 : Metal Extraction and Separation Process :**

Nil

**Category-5 : Alloys, Product Development & Specialty Materials**

There is only one project that has been recommended by PERC in this category. This project entails material - process - product optimization studies by JNARRDC, VNIT together with NALCO. It is well known that direct strip casting is the most energy efficient method of production of some castable aluminium alloys. Feasibility of utilizing some of these strip cast alloys in areas where wrought and heat treatable aluminium alloys are currently used as well as find new downstream applications is the objective of this proposal. This proposal is a good example of lab- academia-industry consortia and it is envisaged that outcomes will benefit both primary producer as well as downstream industries.

**Project ID : 10/46SSAG/CAT-5**

Agenda Item: 1.5

Developing downstream application of strip cast aluminium alloys (AA8011 and AA3004), Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur, Visvesvaraya National Institute of Technology (VNIT) , Nagpur (MS) and National Aluminium Company Ltd (NALCO), Bhubaneswar (Jointly)

Total cost: Rs. 31 lakh (recommended by PERC), duration - 2 years

**JNARDDC**

|                 |                             |
|-----------------|-----------------------------|
| Ist Installment | 2 <sup>nd</sup> installment |
| Rs. 15.00 lakh  | Rs. 5.00 lakh               |

**VNIT**

|                 |                             |
|-----------------|-----------------------------|
| Ist Installment | 2 <sup>nd</sup> installment |
| Rs. 6.00 lakh   | Rs. 5.00 lakh               |

The chairman and members observed that PERC has done a rigorous and elaborate review given that a large number of proposals were received in this call.

SSAG approved all the above ten projects.

Chairman PERC also mentioned that categorization and review processes are now well set and it will be further fine tuned. He also added that a data base of all past projects are being prepared and it will be disseminated through website.

**Agenda Item 2.0****Project ID : 11/46SSAG/CAT-5**

Thin film and Thin wire sensors for Metallurgical Industries : Non Ferrous Materials Technology Development Centre (NFTDC), Hyderabad.

Chairman PERC briefed SSAG, the background of this agenda item. This project was considered by PERC in its 4<sup>th</sup> meeting held on 28.08.2008 and was approved by SSAG in its 38<sup>th</sup> meeting held on 18<sup>th</sup> December 2008. In view of paucity of funds in FY 2008-09 and as the project outlay was significant at Rs 312 lakhs, the funding was deferred. Director, NFTDC also informed SSAG that co-funding from Aeronautical Research and Development Board (ARDB) was obtained in August 2015 to the tune of Rs 76.72 lakhs and together with NFTDC's preliminary work during 2009-11 at Rs 50.0 lakhs, the budget is now reduced down to Rs 179.49 lakhs only. Director, NFTDC also pointed out that thanks to co-funding from ARDB, common process facilities could be incorporated thus catering to both metallurgical and aeronautical sectors and the project deliverables will be a pilot technology facility at TRL 6 /7 levels. He elaborated that thin film technology based sensor development and realization is a complex multi disciplinary endeavour involving high purity specialty materials, engineering design, advanced materials processes and instrumentation & electronics packaging. This endeavour is a quintessential example of materials to components to systems level activity. He further added that NFTDC is now identified as a technology partner in collaborative international projects in the area of sensor development and realization as it has core competence in all of the above knowledge domains. The sensors are very expensive and this facility will give a fillip to make in

India campaign of high technology items particularly for metallurgical process control and can eventually cross fertilize to multitude of sectors.

Total cost :Rs. 179.49 lakh , duration - 3 years

| Ist Installment | 2 <sup>nd</sup> installment | 3 <sup>rd</sup> installment |
|-----------------|-----------------------------|-----------------------------|
| Rs. 114.75 lakh | Rs. 46.68 lakh              | Rs. 18.06 lakh              |

SSAG appreciated the sustained efforts so far taken by NFTDC in steadily progressing in this field with limited internal funds. Chairman PERC informed the SSAG that as the overall budget for this earlier approved project is reduced down to Rs 179.49 lakhs and as the funds are available in FY 2015-16, it is possible to fund this project.

SSAG approved the project for funding in FY 2015-16.

### **Agenda Item 3.0 To review on-going projects : release of balance 10% and recommendation of final technical report**

#### **Agenda Item 3.1**

Feasibility and application of bio-fuel as well as low cost and diluted ANFO for cost effective and safe blasting practices in open cast metalliferrous mines in India (CIMFR, Dhanbad).

The project stands completed and the PI made the presentation in the 14th PERC meeting on 17th October 2015. The balance 10% can be released and the final technical report to be send for review to expert(s).

#### **Agenda Item 3.2: Mineral Systematic Pre-concentration of PGE values from low grade chrome ores of Bould Mines : IMMT, Bhubaneswar**

Project period extension is being sought up to August 2016. It has been noted that the progress in this project has been very limited. A team comprising of two experts from PERC shall review the project in IMMT, Bhubaneswar and make appropriate recommendations to PERC.

### **Agenda Item 4.0 Any other item.**

The following project proposal under mining category was reviewed by PERC and it was not recommended. On request of IBM, it was asked for reconsideration in this SSAG. Chairman PERC, placed this proposal for deliberations in SSAG.

Project title:

Monitoring compliance of approved mining plan in an iron ore mechanized opencast mine using a Wi/Fi with integrated GPS based RFID solution.

Indian Institute of Science, Engineering and Technology (IISSET), Shibpur, WB

The broad outlines of the methodology are: installation of outdoor hardware, customization and installation of equipment tracking software as per site specific constraints, remote connectivity to mine office and field trial.

Member from Indian Bureau of Mines (IBM) observed that this project might be useful in tracking the mining operations for mining companies and also identify illegal mining by regulators.

### Figure (in lakhs) and year wise budget

| 1st<br>Year | 2 <sup>nd</sup><br>Year | 3 <sup>rd</sup><br>Year | Total        |
|-------------|-------------------------|-------------------------|--------------|
| 93.5        | 44.5                    | 11.5                    | <b>149.5</b> |

Chairman PERC and the SSAG members in PERC gave the following feedback on this project proposal.

(i) the proposal is more of integration and deployment of known and existing technologies with market available solutions in sensors such as RFID and thermal imaging cameras, tracking as in GPS and WiFi. It was observed by PERC that the mining companies or a consortium of mining companies as association can be directly contacted for implementation as it would enhance their productivity and effective utilization of vehicle fleet in mining operations;

(ii) the sensors are fairly expensive and the proposal can cover only a small portion of mine and vehicles and therefore its impact of the study will be very limited;

(iii) proposals of this nature require significant co - funding and cooperation from a mining company even to demonstrate a prototype roll out which is not available in the proposal;

(iv) This project envisages carrying out a pilot study, in a mechanized iron mine, in Barbil, Keonjhar district. The funding requirement is very large even for a small pilot study and bulk of it goes for few instruments and more of such devices have to be added to have any significant value. As it pertains to iron ore mines, it is also important to take on board funding from iron and steel S & T schemes as stake holders as well as mining companies.

SSAG noted the observations and felt that the proposal is less of R & D and more of deployment of tracking solutions in mine operations. Given the fact that the funding requirement for putting into place such devices is very high, the involvement of mining companies as stake holders in this exercise is essential. Secondly the utility to IBM for regulation would entail a comprehensive roadmap for such an implementation which it should take up as a near and long term vision of technology intervention in mine surveillance with funding and particularly sustainability. It is decided that proposal be revised and resubmitted in partnership with mining companies with co-funding as well as explore concurrent funding from ministry of iron and steel. IBM should work on comprehensive roadmap for technology intervention in mine surveillance. PERC shall subsequently review on its merit on resubmission.

**The meeting ended with vote of thanks to the chair.**